The Builder.

VOL. LX. No. 2508. SATURDAY, FEB. 28, 1891.

ILLUSTRATIONS.

Byzantine Architecture: Illustrations to Professor Aitchison's Royal Academy Lectures:—
Ornament at Sta. Sophia, Constantinople, and St. Mark's, Venice ..... *Double-Page Ink-Photo.*
Marble Panelling and Mosaic Frieze, Μονὴ τῆς Χώρας, Constantinople.—Drawn by Mr. Sidney H. Barnsley ..... *Two Single-Page Ink-Photo's.*
Hambleton Old Hall: North Front: Plan and Details (from Gotch's "Architecture of the Renaissance in England") ..... *Single-Page Photo-Litho.*
Design for a Staircase for a Town Mansion, by Mr. T. Davison, A.R.I.B.A. ..... *Single-Page Photo-Litho.*

Blocks in Text.

Porch to Gate-house, Kenilworth Castle ..... Page 160
East Frieze of the Temple of Nikè Apteros 162
Diagram illustrating Paper on Ventilation and Warming in "The Student's Column" 175
Plans of Mr. T. Davison's Design for a Staircase for a Town Mansion ..... Page 171
Kiddle Hall, near Leeds.—Sketched by Mr. Percy Robinson 173

CONTENTS.

English Renaissance Architecture 159
The New Interpretation of the East Frieze of the Temple of Nikè Apteros at Athens 161
Notes 162
Byzantine Architecture. V.—By Professor Aitchison 164
Marble and Mosaic: The Architectural Association 167
The London County Council 170
Byzantine Ornament 171
Hambleton Old Hall 171
Design for a Staircase for a Town Mansion 171
The Pre-Greek Schools of Art: Lectures at the Royal Institution 171
Lectures at University College 172
The Sanitation of School Buildings 172
Kiddle Hall 173
Architectural Societies 173
Engineering Societies 173
Free Lectures to Artisans at Carpenters' Hall 174
Builders' Clerks' Benevolent Institution 174
Southampton Baths Tenders 174
Concert Hall, Langham-place 174
The Student's Column: Ventilation and Warming.—VIII. 175
General Building News 176
Sanitary and Engineering News 176
Stained Glass and Decoration 176
Foreign and Colonial 177
Miscellaneous 177
Meetings 178
Recent Patents 179
Some Recent Sales of Property 179
Prices Current of Materials 179

English Renaissance Architecture.

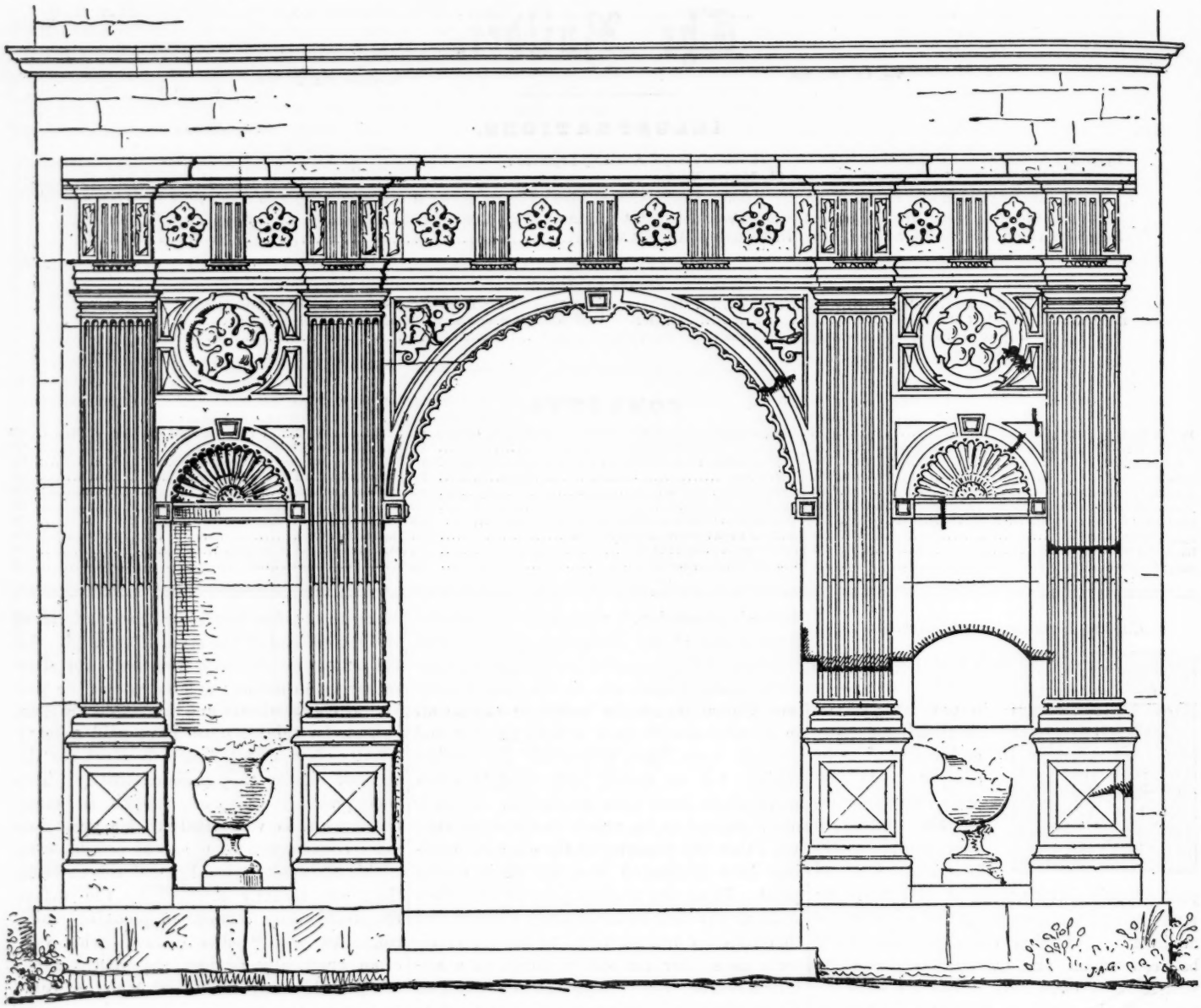
THE first part of Mr. Gotch's new illustrated work on English Renaissance architecture,* to be completed in six parts, promises us, at all events, a very complete and beautiful set of photographic illustrations of the most interesting and picturesque period of domestic architecture of this country. The dates between which the examples are selected will show at once that it has not been the object of the work to illustrate the central type of Renaissance architecture as it existed in this country when the Classic element had attained its full influence, but the period when English architecture was beginning to feel the effect of the Italian revival, but still retaining a specially English character of its own. The mullioned window still remained; the "order" had been adopted in a manner rather picturesque than classic, an elegant ornament to the architecture, but subordinate to the effect of the whole; not, as in the Palladian type of architecture, overpowering and crushing the domestic feeling and expression out of the building. It was fortunate that the taste for sumptuous habitations, and the spirit of rivalry among wealthy and powerful Englishmen in this respect, should have arisen just at this juncture, when the Renaissance movement had brought into England a taste for dignity and refinement in the architectural design of houses, but had not yet obliterated the feeling for freedom of treatment and picturesqueness of plan and outline. In regard to this matter of plan, however, we cannot but express our disappointment in regard to the almost entire absence of plans, the only plans given being the small one of Apethorpe in the text, and that of Hambleton Old Hall, which is included in the page of illustrations from this interesting house which, by the author's permission, is reproduced to a smaller scale as one of our lithograph plates in this number. Of course the production of complete plans which are to be trustworthy would have immensely increased the labour in connexion with such a work as this, and perhaps even have prevented the undertaking; but we should have thought a few more might have been attainable. There is one argument to be urged on the other side, viz.: that the planning of the class of buildings here illustrated was not their strong point. From the modern point of view they were mostly very inconveniently planned, and therefore are not of value to modern architects as matter for study, except in a historical sense. The main object in building an Elizabethan or Jacobean mansion was not to produce a convenient or economically-planned house, but a stately one, which would show an impressive front on approaching it, and a fine suite of entertaining rooms within; and the end was more especially attained if these were finer and more stately than those in the new house of some rival owner in an adjacent county. This feeling of indifference to the minor and more prosaic elements of house-building is emphatically shown in the manner in which Bacon, in his otherwise admirable and suggestive essay "Of Building," dismisses the whole subject of subsidiary and service rooms in one curt sentence at the close of his essay—"As for offices, let them stand at distance, with some low galleries to pass from them to the palace."

It should be observed, before we go further, that the line drawing of which we give a reproduction does not represent the character of the bulk of the illustrations. Most of these are reproductions from photographs taken from the buildings, and produced by what in England is called the "Phototype" and in Germany the "Lichtdrück" process. The author has gone to Germany for the reproductions, which are very good, and represent the details of the buildings with great sharpness, the texture and jointing of the stones, and the incidents of light and shadow. But all this can be done as well in England, and we do not understand the fancied necessity which is supposed to have driven the author or his publisher to Germany to procure this form of illustration.

In his Introductory chapter the author sums up in a few words the characteristics of the period and of the style illustrated. All the houses, he observes, were built for show rather than comfort; symmetry was the prevailing characteristic, and the dwellers in these houses, he thinks, must have paid a heavy penalty often, in internal discomfort, for the show of dignity they made externally. This was probably the case, though in many instances it is very likely that a great deal more convenience of plan was possible even within the symmetrical lines of the exterior, than was actually attained by the rather rough-and-ready manner of planning which contented the "noble owner," who very often practically devised the plan himself, and probably only found out when he came to live in the completed house how many things he had overlooked. In the case of Burghley House, as is well known, and as Mr. Gotch notes in his remarks on the illustrations, the workmen applied directly to Lord Burghley for instructions, which he seems to have given according to his own ideas, but with the help probably of this or that expert as required. It is obvious that though a picturesque house could be built in this way, it would be impossible under this system to carry out a properly-devised and convenient plan.

The essay of Bacon, just now referred to, is of peculiar interest in regard to the illustrations of houses which belong to the date at which Bacon wrote, and some of which seem almost to have furnished the hints for his remarks and criticisms. What sort of house it was that the Elizabethan nobleman or statesman dreamed of for himself, and accomplished if he could, we might gather pretty accurately from this essay, even in default of existing examples. Bacon indeed begins by observing that "houses are built to live in, not to look at, therefore let use be preferred before uniformity, except where both may be had." But he soon shows that he was as much taken as any of his compeers with the idea of symmetry. He admits that you cannot have a perfect palace "except you have two several sides," one for feasts and triumphs, the other for dwelling, but he goes on to say that they should be "uniform without, though severally partitioned within," in which of course he gives away at once his previously-expressed

* "Architecture of the Renaissance in England: illustrated by a series of views and details from buildings erected between the years 1560-1630, with historical and critical text;" by J. Alfred Gotch, F.R.I.B.A., assisted by W. Talbot Browne, A.R.I.B.A. Part I. London; B. T. Batsford; 1891.



Porch to Gate-house, Kenilworth Castle.

Reduced from a plate in Mr. Gotch's "Renaissance Architecture in England."

opinion that houses were built to live in and not to look at. His remark in speaking of the two sides, "I understand these to be not only returns, but parts of the front," does not mean that these two main portions of the house were to be carried round the angle with the same architectural treatment, as he afterwards describes the court behind as consisting of three sides "of far lower buildings than the front." His house is therefore essentially a large state block in front, with wings of inferior dimensions in the rear. In regard to the arrangement of this main block he says:—

"I would have, on the side of the banquet in front, one only goodly room above stairs, of some 40 ft. high, and under it a dressing or preparing place, at times of triumphs. On the other side, which is the household side, I wish it divided at first into a hall and a chapel (with a partition between), both of good state and bigness; and those not to go all the length, but to have at the further end a winter and summer parlour, both fair: and under these rooms a fair and large cellar sunk underground, and likewise some privy kitchens, with butteries, pantries and the like. As for the tower" (he has previously mentioned a tower in the centre of the block as essential) "I would have it two stories, of 18 ft. high apiece above the two wings, and goodly leads upon the top railed in with statues interposed."

The wings of lower buildings at the sides, flanking the inner quadrangle, are to be "all stately galleries" on the state side of the house, "with three or five fine cupolas placed at equal distance, and fine coloured windows of several works." The special requirement of "three or five" cupolas of course refers again to the prevalent idea of symmetry; there must be an uneven number in order to have a centre one and a similar design on each side, and the expression shows emphatically how prevalent was the idea then of the necessity for symmetrical arrangement in every part of a building. On the household side the wing is to contain "chambers of presence and ordinary entertainments," with some bedchambers; "and let all three sides be a double house, without through lights on the sides, that you may have rooms from the sun both for forenoon and afternoon." Bacon had evidently felt the inconvenience of too much sunlight in these large-windowed houses, remarking almost immediately afterwards that "you shall have sometimes fair houses so full of glass that one cannot tell where to become to be out of the cold." (Was he thinking of Hardwick Hall?) The court is not to be paved, "for that striketh up a great heat in summer and much cold in winter," but divided by cross walks into four quarters of grass, "being kept shorn but, not too near shorn." He hardly seems to have appreciated therefore the beauty, in connexion with a symmetrical architecture, of what Milton calls the "smooth-shaven lawn," which as a matter of effect, can hardly to our thinking be kept too neat and close-cut in such a position. He seems to have forgotten again his objection to paving, for in speaking of the further or second court he says "paved as the other court was"; unless he means to imply that it should be formed with cross walks similar to the other court. This second court is to be a cloister court, and surrounded on all sides by the garden, the lower story towards the garden being a place of shade. The rooms in this court are to be of a more private character, and one of them must be for an infirmary, with "anticamera" and "recamera" joining it, "if the prince or any special person be sick" (Bacon always moves among great personages). But we have not yet exhausted our courtyard effects, for we must have no less than three successive courtyards in front of the house, to make a gradual and duly impressive approach: "a green court plain, with a wall about it; a second court of the same, but more garnished with little turrets or rather embellishments upon the wall; and a third court, to make a square with the front, but not to be built, nor yet enclosed with a naked wall, but enclosed with terraces leaded aloft, and fairly garnished on the three sides, and cloistered on the inside with pillars, and not with arches below." The last sentence is not very plain; we take it to mean that there should be a colonnaded terrace walk some little height above the ground level, and with a solid and not an arcaded basement-wall under it. In such a case the colonnade and basement might range with the basement and part of the columnar decoration of the house, so as to connect it with the whole courtyard, and this idea may have been in Bacon's mind, but he does not make any suggestion of it.

So much for Bacon's practical exemplification of the principle with which he started, that houses were built to live in and not to look at, and which nevertheless seems to admit, in his idea, of an expenditure upon mere adornments and approaches which none

but a Crœsus could realise, and throughout which the idea of complete symmetry of design and laying out is emphasised. And on the whole it must be admitted that for houses on a large scale and in which it is intended to give an impression of palatial dignity, there is nothing like symmetrical design, provided it can be carried out in a rich and sumptuous manner. No doubt a dull, flat, and economical architecture looks doubly dull and flat when treated symmetrically; but where there are the means to realise a fine architectural treatment without stint in regard to cost, nothing is so dignified and stately as a symmetrical design. No doubt, like blue china, it is difficult to live up to; it suggests a kind of semi-palatial and princely order of life, and perhaps therefore should be avoided where there is not the means or the desire to keep up this kind of state. But even on a small scale, symmetry, provided that it is an elegant and not a heavy order of symmetry, will sometimes suffice to raise a small house to an appearance of dignity which it could not otherwise possess. This is very well exemplified in the elevation of Hambleton old Hall, which we have reproduced partly on that account. Apart from its symmetry and the arcade in the centre, this would be just a farmhouse; these features raise it to the rank of a gentleman's house. This little building is an example also of one of the characteristics which Mr. Gotch notes in regard to this early period of the English Renaissance, the combination of the gable with the use of the classic column. In the arcaded parapet is seen a curious reminiscence of Gothic detail, in the use of the triangular sinking in the spandrels of the arches, just as we see it in the interstices of Gothic tracery. It does not harmonise with the rest of the central portion of the building, nor with the use of the keystone to the arch, but it is historically a very interesting bit of detail.

Another of the features to which Mr. Gotch draws special attention is the use of the large mullioned windows along with Classic detail. This feature had sometimes a practical value in enabling the architects of the larger houses in this style to carry out that union of exterior symmetry with varied interior arrangement which, as we have seen, Bacon regarded as one of the desirable qualities in a large mansion. These large mullioned windows enabled the architects on occasion to use the same window design for a single story in one position and for a double story in the corresponding position on the other side of the central feature; a method of treatment sometimes used in large houses of this class, as in Hardwick Hall, and which is quite indefensible on pure architectural principles, and only to be pardoned as an occasional vagary on the part of an architect struggling to combine external symmetry with internal freedom; a combination absolutely illogical and improper, and which can only be regretted as an occasional weakness in an otherwise fine type of domestic architecture.

The finest portion of Burghley House, which forms the first series of illustrations, is the central feature of the courtyard façade (plate 3). The detail of this is curiously incongruous. Three orders are employed in the engaged columns which occur in couples, with niches between them, on each side of the central openings; Roman Doric on the ground story, Ionic in the middle story, and a miniature Corinthian above. The boldness of treatment of the centre is remarkable, with its large semi-circular arch enclosing the doorway, a similar large arch on the first floor, with a deeply shadowed cavity beneath it, against which stands out the bust which is fixed on the centre pedestal of the balustrade. On the third story the slightly projecting mullioned bay-window appears to be an interloper from a different world of architecture. The square mass of the centre turret with its lofty pyramidal spire seems rather to crush this window. At the sides the smaller pyramids, with their curious inverted scrolls at the base, cut through so as to leave an opening against the sky, are almost grotesque in taste, but the bold manner in which they are connected with the central feature by the colossal conventional heraldic lions is very fine. In the same view are seen two of the curiously-formed and utterly inexcusable chimneys, formed of coupled columns with a piece of architrave laid across them, which in turn carries the chimney-pots, the columns being apparently hollowed as flues. Taken by itself this is as bad a piece of detail as could be found; but when seen at a little distance on the approach to the house these features assist in giving it that remarkably picturesque and multitudinous effect of skyline which is the first thing that strikes one in the building; and which, however Classic some of the details may be, is in its *ensemble* much more Gothic than Classic in feeling. Where three or four of these columnar flues are combined together they look rather better than the coupled ones, and at a sufficient distance one does not realise exactly what the detail is which has been so much misapplied. The west front of the house, with its octagonal turrets and cupola terminations, is far more Mediæval than Renaissance in general appearance; indeed with the exception of the curious balustrade with its little obelisks on pedestals between the open arches, there is not a Renaissance detail in it. The most singular incident in the architecture is the sloping downward of the strings over the first-floor windows on the north front, from the centre to the angle, the window heads being gradually lowered with them. The author merely draws attention to this peculiarity, without suggesting any explanation of it. It is obviously an unintentional feature, probably the result of some carelessness in the setting-out of the heights on the west front, which were found not to correspond on the upper story with those of the central feature of the north front, and this rather clumsy way was adopted of rectifying the error.

Hardwick Hall, as Mr. Gotch says of it, is a flat tame uninteresting building, characterised by a series of very large windows, all nearly alike and all bald in design and destitute of cornices or other architectural embellishment. The boundary-wall of the enclosure, which is seen in the foreground of the view, is interesting in relation to a remark in Bacon's essay. We have already suggested that possibly Hardwick Hall gave rise to his complaint about the superabundance of windows in some great houses. The series of ornamental features on the coping of this wall exactly answer to Bacon's description of the second court of entry to his imaginary mansion, "garnished with little turrets, or rather embellishments on the wall;" the sentence might have been written as a description of it.

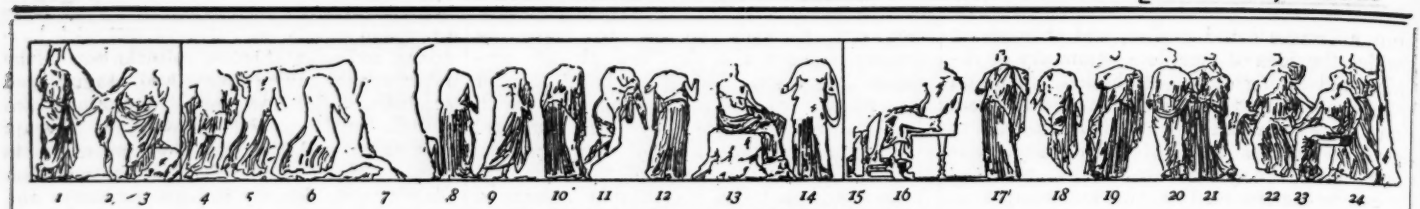
The claims of Haddon Hall to be classed among Renaissance buildings are barely apparent on its exterior, at least on the garden front which forms the first illustration, and it is curious to compare this with the almost entirely Renaissance style of the wainscotting of the Long Gallery, which is the subject of the next plate. The Gothic spirit still asserts itself in the plastered ceiling with its tracery design, but in regard to the woodwork the interval between designing the exterior and fitting the interior was evidently sufficiently long for the Gothic spirit to be laid and the Renaissance to take its place. Park Hall is again a curious mingling of Gothic feeling with bits of Renaissance detail, shown chiefly in the Ionic capitals to the wooden pilasters, and in the shape of some of the flat uprights of the black and white work, which resemble the silhouette of a baluster. Between the Ionic-headed pilasters the spaces are occupied by quatrefoils in black and white, as nearly Gothic as possible. Apethorpe Hall (pronounced Apthorp) has the singularity, in the court-yard view, of appearing much more Renaissance in the ground-story than in the upper portion, the ground-story consisting of a rounded arcade on columns and with keystones, and an entablature over the arcade, the upper stories having square-headed mullioned windows, which however are just classicised a little by the piece of entablature inserted over them and the fluted ornament in its frieze. How often this combination of a Classic entablature in ground-story and mullioned windows over it has been imitated in recent architecture it is unnecessary to observe; it is a combination rather piquant in itself and which has taken the fancy of the present generation of architects, who are now disposed to act over again the mixture of styles which in the sixteenth century arose naturally out of the then circumstances. This imitation will probably not have any more lasting influence than other imitations; it is something new for the moment, no doubt, and gives a pleasantly old-fashioned look to a new building. Stibbington Hall is chiefly noticeable for its curious gateway, with an open gable of reflex curve (as if the walling had been taken away and only the coping left), enclosing an open circle within it. It is not beautiful, and it is to be hoped no one will try for "originality" by copying it, but it is an interesting relic of the architectural fancies indulged in at this period.

It must be admitted that the letterpress of the book is rather meagre, and that the author seems to have thought it sufficient to give a few remarks as to the date of each building and one or two of its peculiarities, without going further into its history. This is to be regretted, because Mr. Gotch has the capacity to write very well and picturesquely on subjects of this kind, and he would have added to the popular value and interest of his book in giving full literary descriptions of the buildings. As it is, we do not very well understand whether the book is intended for architects or for the general public. If for architects, it is deficient in plans and measured drawings; and even in regard to the views we must confess that we prefer drawings to photographs, provided they are accompanied with a sufficiency of measured details; there is a separate interest in drawings for their own sake, arising out of the style and feeling in their execution, which does not belong to a photograph. Where measured details are but sparingly given, no doubt a photograph, when reproduced by a process which leaves the detail clearly defined, is the method which can be best trusted to give all the detail as accurately as the scale will allow. But a series of photographs, with a few words of explanation to each, is not all which used to be looked for in a large illustrative work on architecture. Times are changed, and books we presume must be produced more quickly as the age moves quicker; but they cannot in that case have the monumental value which attached to some of the typical architectural illustration books of the previous generation, such as Sharpe's "Parallels" and Bowman and Crowther's "Churches," and others that some of our readers will recall.

THE NEW INTERPRETATION OF THE EAST FRIEZE OF THE TEMPLE OF NIKÈ APTEROS AT ATHENS.

THE east frieze of the Nikè temple has long remained an unsolved problem,—a problem, too, of which archæologists were confessedly a little weary, and which they had allowed to fall into temporary abeyance. And yet the marbles are in fair preservation; twenty-four figures, every one of which has left substantial traces, still tempt conjecture.

As so often happens in such cases, it is not the actual monument itself that has prompted a fresh suggestion. Dr. Bruno Sauer has been led to his new interpretation by a study of a well-known terra-cotta plaque in the Smyrna Museum. This plaque has usually been held,—though the view has always been beset with difficulties,—to represent the strife between Athene and



East Frieze of the Temple of Nikè Apteros.

Poseidon for the dominion of Athens,—the contest being decided by voting. Dr. Sauer holds that the scene represented is the decision of the gods between Asia and Hellas. Further, he believes the terra-cotta to be only an excerpt from a larger composition representing the same scene, and this composition he believes to have been the east frieze of the Nikè temple. How fitly such a subject would adorn the little temple that crowns and guards the Acropolis approach need scarcely be pointed out.

The details of the interpretation will best be followed by reference to the accompanying wood-cut, and indeed it is only by a careful examination of the composition of the frieze and the balance of its various parts that the necessary conditions of any just interpretation can be realised. The two principal figures (13 and 16), manifestly important divinities, are seated near, but not precisely at the centre, between them is a standing woman, figure 14. To the right five (17-21), to the left four (9-12) figures are standing in repose, and evidently in conjunction with the seated ones. Among these quiet standing figures, one in each group (10 and 19), is distinguished from the rest by superior majesty and dignity of pose. At the extreme left are three quiet figures grouped together (1-3). Moving towards the centre, three in rapid motion (4-6) of the corresponding figures to the right. Only one of these in motion (24) is preserved. On the left a definite *cæsura* divides the three figures moving towards the centre from a seated one (7), with a standing figure near her (8), and this pair are again, though less markedly, divided from the middle figures. In this last respect left and right balance, but when it comes to the seated and standing pair on the right two things are noticeable: first the group of two on the right are in action, not quiet like that on the left, and second, the *cæsura* noticeable on the left has quite disappeared on the right.

Returning to the centre group, it is of the first importance to note that the middle front is occupied, not by any figure, but by the junction of the two slabs. Immediately to the right of this, and balancing the standing figure Athene (14), are the remains of some vertical supports, which have been usually taken to be human legs, and accordingly explained as either Pan or Ganymede. A close examination proves that they are too square to be human, and that, in fact, they are nothing more (as is evident from comparison with similar objects on coins) than the vertical supports of a table shown in perspective—a table similar to that seen in the Smyrna terra-cotta.

We have, then, an assembly of the gods, and a table in the most prominent position. Comparing the scene with the Smyrna relief, it is evident we have some ceremony of voting in the presence of the gods. The figures 13, 14, and 16 are Poseidon, Athene, and Zeus, but they do not fix the subject of the controversy; for that, Dr. Sauer thinks, we must refer to the seated woman figure (23). The figure is undoubtedly characterised in the most marked fashion,—as in deep sorrow and anxiety, with drooping body and sunken head. Clearly she has every reason to be concerned in the issue of the voting. Her counterpart (7), though much mutilated, can yet be made out as sitting erect, and apparently fearless. The voting is clearly not between two rivals for possession, but between accused and accuser, as in the case of Orestes; the figure 23 is the accused. The meaning of such a scene, represented on the Nikè temple, would be obscure enough but for the design on the well-known "Persian" Lower Italy vase. There Asia, seated aloft, challenges Hellas, who is sorely beset and troubled, but sustained by the support of Zeus, Athene, and Nikè. The scene on frieze and vase alike is, of course, supposed to take place *before* the first Persian war. It is throughout conceived on the lines of an Attic law-suit,—accuser and accused when not pleading are seated. Zeus, who has instituted the suit, presides conjointly with Poseidon. Athene is counsel (*συνήγορος*) for the accused Hellas, and she, with the table that holds the voting urn, occupies the centre. The figures in motion are also intelligible on this supposition. The maiden (figure 22) plays the part of court messenger, summoning the other maiden (24) as witness on the part of the accused.

The remaining figures can be named with, at least, considerable probability. No. 18 is unquestionably, from the remains of goat-legs, Pan, who played so prominent a part as ally of the Athenians. He is balanced by (11) Theseus, a figure familiar in this relation from Mikon's Marathonomachia. Aphrodite (3), with Eros (2), and Peitho (1) stand to the extreme left as disinterested spectators. The stately woman-figure (17) immediately behind Zeus must be Hera, balanced by (12) Amphitrite behind Poseidon. The two closely-united figures, 20 and 21, can scarcely be other than Demeter and Korè. It is probably not by accident that the central groups of quiet figures judging the cause are twelve, and yet clearly, if Theseus and Pan are present, they cannot be the twelve orthodox Olympians. This is important when we come to decide the attribution of the two imposing women-figures 10 and 19. In connexion with these two figures, it should be noted that in the Smyrna terra-cotta of all the twelve judges, only two remain—Athene and Poseidon, and these as the representatives of the two dominions of land and sea. It does not, therefore, seem too bold to call the two majestic women figures, Gaia and Thalassa, the impersonations of Land and Sea, standing here as opponents, not as in the East pediment, united into one group. Thalassa is well in place (10) on the side of Poseidon, and near to Theseus (11), Poseidon's son. Given this attribution, and it is natural to call the mature male figure (9) Aigeus, whose story was so closely linked with the Nikè temple, and whose Heroon stood just below. Gaia also on the land side (19) is well in place between Pan and Demeter, and Korè and her figure is strikingly like that of the statue now explained as Gaia Kourotrophos in the Acropolis Museum.

It may possibly be felt by some that so realistic a representation of a law-court scene is inartistic; this, however, is surely a modern rather than an ancient objection. The law-court scene in the Eumenides is no less precise in its realistic scenery, yet no one feels it is unpoetical. The issues were large enough to redeem the contest from all pettiness:

> "Too well, too well was the great stake worth
> The strife divine for the gods to judge."

THE PANAMA CANAL.—The reconstituted Panama Canal Company has succeeded in concluding a new agreement with the Republic of Colombia respecting the Canal works. The time for the completion of the Canal is extended to the year 2000, but effective work on the Canal is to have commenced by February 28, 1893. The assets of the old company, including machinery, &c., are to be transferred to the new one, which will also wind up the old concern. In return for these concessions, the Colombian Government is to receive £400,000 in gold and £200,000 in Canal shares, with the right of having a representative on the Board.

NOTES.

THE announcement that the Government has decided to issue a Royal Commission to inquire into the relations of capital and labour has been received with much satisfaction in many quarters. It will, no doubt, be useful to Conservative speakers at the General Election: it will be paraded as showing the interest which the Government takes in the well-being of the artisan class. But it is difficult to see what practical result can follow from the report of the Commission. It will give much interesting information to the public, but it cannot produce a panacea for the disputes between employers and employed. Should a State Board of Conciliation be established? The country and Parliament can decide this question just as well now as when a Royal Commission has reported. The appointment of such a Commission is also liable to create hopes which cannot be realised, and may, in fact, do more harm than good.

THE conclusion of the House of Commons to refer the London Water Commission Bill to a Select Committee was the best that could have been come to, provided that the other Bills to be brought forward in relation to London water supply be treated in the same manner and referred to the same Committee, as they probably will be. The subject is far too large and important to be dealt with hastily or without the fullest investigation. The debate was marked, we are glad to see, by a generally reasonable and judicious tone in the main, and it is satisfactory to find more than one prominent member of the House supporting the view, which we believe is the only practical one, that the London County Council is the proper body to have control of the water supply. The appointment of a new and separate public body to deal with it is both unnecessary and likely to prove inconvenient, as well as expensive.

IT is a pity that the Cheap Trains (London) Bill was not defeated by a larger majority than the 19 recorded. As Sir J. Pease said, the Bill really represented the kind of philanthropy which consisted in A saying that B ought to hand over something to C. It appears that as a fact some of the railway companies now provide workmen's trains at a cheaper rate than this Bill demanded. That depends of course on the nature of the traffic of the railway and on the districts which it serves. To mark out an area round London within which all railway companies should be compelled to carry workmen at a rate unremunerative to many of them would in the end only lead to an extension of London to the limits of that area, and to a most inconvenient and dangerous swamping of other classes of railway traffic.

IN Berlin, and in its artist circles especially, the two main topics of conversation are the Raschdorff Cathedral design and the International Art Exhibition. The latter has now a certain amount of political importance attached to it, since the Emperor seems to wish to commence friendly relations with France on a basis of mutual art interests, and since the steps taken by him on the occasion of Meissonier's death, and lately again at the French Ambassador's dinner, are likely to have the result he aims at. The reply from the Paris Academy to the Emperor's letter of condolence was couched in the most agreeable terms, and a few days after the

Ambassador's dinner one heard of the formation of a Paris Committee, including names such as those of Détaille, L'Hermitte, Bougereau, Cazin, &c., for the arrangement of the Exhibition contributions. The delegate of this committee has been to Berlin; the Berlin Managing Committee has put one of its best halls at the disposal of French exhibitors, and judging from the names already entered this group promises to be a representative one.* England seems to have elected Professor A. Lutteroth, of Hamburg, to manage the arrangement of its group, and the Professor's long list of names contains among others already those of Sir F. Leighton, Millais, G. F. Watts, Pettie, Henry Moore, Wimperis, Th. Collier, Alma Tadema, Walter Crane, Orrock, Marcus Stone, Ford, Simonds, Gilbert, Thornycroft, &c. The Italian delegate's list is a still longer one, and includes loan pictures from the Roman National Gallery. Belgium, Holland, and Spain, will be well represented, and as to Austria, we hear that the Managing Committee are already at a loss to know where the unexpectedly large number of exhibits for this group are to be hung. It may be advisable to state that although, as stated in our last number, the time of delivery for would-be exhibits is from March 14 till April 10, that it is customary, and in the interests of both exhibitor and Exhibition Committee, that a notification as to the size of the work to be presented for admission be made to the delegate† as soon as possible. In reference to the Architectural Division of the Exhibition, which, by the bye, is to be the forerunner of the International Architectural Exhibition to be held at Berlin, 1896, we hear that the committee of architects in charge have now unofficially made known their wish to prevent the admission of architectural exhibits in the form of photographs. Photography is only recommended as a practical means of reducing plans to a more convenient size for exhibition purposes.

THE latest number of the Athenian *Mittheilungen* of the German Archæological Institute (xv., 4) is chiefly taken up by the long-delayed report of the discoveries at the temple of the Kabeiroi, near Thebes. Two years ago (No. xiii., p. 412) the vases discovered were discussed, and in part published. The present number deals with the terra-cottas, bronzes, and inscriptions. In striking contrast to the vases, the terra-cottas which have been found by thousands present no especial local characteristics; they are similar to those found everywhere in Bœotia and Locri,—the same type occurs in endless repetition, *e.g.*, there are 250 sheep, 200 pigs, 25 recumbent lions, 30 seated lions; the goat-legged Pan occurs 25 times. After the remarkable interest of the vases, it must be confessed that the remainder of the find is somewhat disappointing, though the inscriptions—many of which are reproduced in facsimile—will be full of interest for the specialist in epigraphy. The report is the joint work of Drs. Tzanto, Graef, and Wolters. To the same number Dr. Dörpfeld contributes a paper on the now famous inscription published by Lölling (Δελτίον 1890, p. 92), in relation to the early Athene Temple of the Acropolis. This inscription, found in a number of fragments and skilfully put together by Dr. Lölling, yields the following substantial additions to our knowledge of the temple in question. We learn from it that in the 6th century B.C., the whole building went by the name of the Hecatompedon—further, that its back portion served as a treasury, and consisted of several chambers. The further question arises and is answered in the affirmative by Dr. Lölling, Did the temple continue to hold its name of Hecatompedon after the building of the Parthenon? Dr. Dörpfeld thinks not; he holds that after the building of the Parthenon the old temple was called ὁ ἀγχαῖος or ὁ παλαιὸς νεως, and the name Hecatompedon was transferred to the cella of the new temple, which was in itself exactly 100 ft. long. This view he supports in detail by arguments turning mainly on the general disposition of the new temple, the name of its various parts, and the notice we have of the treasures stored in these several departments. In the general report, which concludes the number, hope is held out that the topography of the Athenian agora may before long be established. The Peiraeus railway is to be extended, and will pass under the present "Athena" street. This will involve the pulling down of many modern houses, and the line must cross the ancient road that led from the Dipylon to the agora. It will be hard if the excavators do not come on some ancient remains of topographical importance.

AT the last meeting of the Hellenic Society on Monday afternoon, when there was an unusually large attendance, Mr. Ernest Gardner read a very interesting and judicious paper on Dr. Schliemann's life and works, giving full value to all that Schliemann did for archæology, but without crediting him with all the discoveries which he claimed, or losing sight of the fact that he was a very fanciful and imaginative explorer, and too ready to believe he had found what he wished to find. Professor Gardner declined to give the name of "Troy" to Hissarlik; the Troy of Homer, he said, was built in the same country as the Camelot of the Arthurian legends, and its relics would not be discovered by any delving in material soil; but that did not lessen the archæological value of what Schliemann actually did find there. Mr. H. W. Schultz then read a long and learned discussion on the north doorway of the Erechtheion, showing that it was probably not contemporary with the rest of the building. The substance of this paper had been before given in the form of a lecture to the British School at Athens, and a résumé of it was given in the *Builder* of March 22 of last year (page 208). There can, we think, be very little question that Mr. Schultz is right in his conclusions, but the reasoning must have been quite unintelligible to the majority of the audience on Monday for want of any illustrations such as could be seen and referred to by them as the paper proceeded. This is a constant cause of complaint at the meetings of the Hellenic Society, where papers are read the comprehension of which depends entirely on illustrations, and none are forthcoming except perhaps a small sketch or photograph which is laid upon the table where no one can see it, and the listeners are expected patiently to follow the references to what they cannot see. Once or twice we have seen duplicated illustrations handed round, but this is an unusual grace. The Council of the Hellenic Society ought to see to this, and to exhort readers of papers to provide the audience with intelligible illustrations, and to provide themselves a screen on which to hang them, and a black-board on which a lecturer could make a graphic demonstration of his subject when necessary. For want of any effort, apparently, to make such provision, many of the papers read at the Hellenic Society's meetings are entirely thrown away, and people are induced to waste their time in listening to views which it is impossible for them to understand or follow out for want of adequate illustration.

IN the last number of the *Jahrbuch* of the German Archæological Institute there appears a criticism by Dr. Furtwängler on the report of the excavations carried on by Messrs. J. A. R. Munro and H. A. Tubbs in 1889 at Polis-les-Chrysochon, in Cyprus, for the Cyprus Exploration Fund, and which was published in the *Hellenic Journal* of last year. This criticism practically resolves itself into an attack on the sufficiency of the training of British archæologists and their competence for undertaking work of this kind. Dr. Furtwängler attacks our scholars with some vehemence, and supports his charge by what he calls "quotations" from their report. Unfortunately, of the two passages cited one is a short phrase picked out from the middle of a sentence, and, robbed of its context, it amounts to a *suggestio falsi* on the part of the critic; the other is the exact reverse of its professed original. Dr. Furtwängler is as unfortunate in the remainder of his strictures as in his manner of uttering them. It is true that the new material furnished by the excavations agrees but ill with earlier theories like those of Dr. Furtwängler; still, it is an amusing instance of the way in which a pet prejudice will bias even clever men, that the German critic, besides making a serious misquotation, should try to prove that a fact is not a fact by first assuming it to be unreal, and then, on his own assumption, discrediting the character of the author from whom it is quoted. Dr. Furtwängler believes that a certain class of pottery was manufactured only at an early period. The excavators state that they have found it accompanying other kinds of pottery and miscellaneous objects which Dr. Furtwängler considers of a later epoch. *Therefore*, concludes our critic, the excavators are "deficient in archæological training," and he expresses a wish that in future the Cyprus Committee will send out more competent men. Such a method of argument hardly requires comment.

MR. EWAN CHRISTIAN has addressed a letter to the *Times* of Tuesday in deprecation of any proposition to remove Hanover-square Chapel, Regent-street, a subject to which we have already called attention. Of course if the chapel is no longer required for public worship in its present position it would be difficult to make out any practical case for retaining it. On that point we have no information. But it would be much to be lamented if Regent-street were to be wantonly shorn of what may be said to be the only piece of real architecture in the street; and that too the design of a man who, both in regard to character and ability, was an honour to English architecture.

THE small town of Wells-next-the-Sea, so called apparently because it is a mile and a-half from the sea, and only connected with it by a narrow channel, has been occupying the attention of the Local Government Board, and Mr. Spear has reported on its condition, which seems rather primitive, though the health of the place seems better than might have been expected under the circumstances.

"In the drainage of the town advantage has been taken of the natural contour of the ground already described. Some two-thirds of it drain northwards by sewers which open into the sea channel, or, as on the western extremity, into a dyke, which itself later discharges into the channel. The remaining third, or southern portion of the town, is drained in an opposite direction, the sewers here discharging into what is described in old maps as "the old public drain." This latter, which probably marks the bed of an ancient watercourse, has now, throughout the greater part of its length, been culverted; it discharges into a dyke which, after a circuitous course through the marshes, finds an outlet into the sea channel. In the dyke on the western extremity of the district, before spoken of, as also in the unculverted portion of the "old public drain," sewage stagnates to some extent so as to cause a nuisance. The attention of the authority is now being directed to this matter.

The sewers of the town consist partly of old brick culverts and partly of socketed pipes of more modern construction. Man-holes and surface ventilators have not been provided, but the gradients are said to be good, and the sewers consequently fairly free from deposit. Flushing, when required, is effected through the roadside gullies. Ventilation, if so it may be called, is imperfectly provided for by the rain-water spouts of houses only. The drain connexions on private premises are often imperfect; in many cases drains are of the old, rough brickwork, while yard-gullies are in many cases untrapped, or still more often protected by the bell-trap only. There are very few, if any, water-closets connected with the public sewers."

The town has been the paradise of privy pits, the majority of the old deep ones being now done away with, and their place taken by

d

* Unfortunately since this was written there seems to have been rather a reaction in the French capital against the idea.

† We repeat the address of Herr Jobelmann, from whom detailed particulars of the Exhibition regulations, &c., can be had: Wilhelm Strasse 92, Berlin, W. Letters to the English delegate should be addressed to Prof. A. Lutteroth, Uhlenhorst, Hamburg. Special particulars of the Architectural Division can be had from Prof. F. Wolff, Schelling Strasse 15, Berlin, W.

cemented pits "believed to be watertight," and which are only sunk a few inches below the ground. This is an important point, certainly, where all the water is obtained from wells, of which the town is full.

"Pure water was hardly to be expected from shallow wells sunk in a soil that had been occupied by human beings for ages, in yards that were often unpaved and very close to privies and drains which have only in recent years, if even now, been made water-tight, and analysis confirms this view. Samples of water, taken from wells on the south, in the centre, and on the north of the town, were sent to Dr. Frankland for analysis, and are all classed by him as 'dangerous.' The question of providing Wells with a general water service is one that has not yet been seriously considered by the authority; although the practicability of sinking a public well at the higher central and open part, near the 'Butt Lands,' lifting the water to a tank tower, and thence distributing it by gravitation, has been informally spoken of."

In the meantime, in spite of general good health, one decided outbreak of typhoid has occurred, and the original focus of this has been established as in the neighbourhood of a well, afterwards found to be polluted, among the people using its water. We should advise Wells-next-the-Sea not to postpone practical steps towards procuring a new and pure water supply.

SEVERAL interesting scientific papers will be found in the journal of the Franklin Institution, published last month. A graphical method of determining the stresses in continuous girders is described by Mr. C. H. Lindenberger, who also considers the effect of the moment of inertia not being constant throughout the beam, a condition which materially increases the difficulty of the subject. Mr. L. d'Auria gives some facts relating to his former article on the force and impact of waves and the stability of the superstructure of breakwaters, and in addition to these papers there are others on "Photography in the colours of Nature," and "Electricity, its past, present, and future," besides those which are contributed to the chemical section.

THE exhibition at the Burlington Fine Arts Club, illustrating "the French revival of etching," as might be expected from its title, is of exceptional interest in regard to the quality of the works exhibited, though their number is not very great. The collection includes, however, a very representative selection of the etchings of Méryon,—a considerable proportion of which consist of those half-weird representations of old Paris in its mingled griminess and picturesqueness, about which seem to hang such memories of violence and crime. The "Stryge" of course is there, two impressions: and the drawing of the old Morgue, which a great English poet has celebrated in his own powerful and original fashion, and "St. Étienne du Mont," showing white between the masses of houses in deep shadow; and the remarkable picture of "Part of the City of Paris" (34), a scene with a whole chapter of history expressed in its grim squalor. There is a drawing of the old "Pont au Change" (31) with the houses crowded on it, as described in our recent article on the Paris Bridges (page 121-2 *ante*). The "Rue de Mauvais Garçons" (17) is another of these gloomy corners which seem to have had a strange fascination for Méryon. The "Galerie de Notre Dame" (16), in the interior of the tower, is a fine architectural subject of more everyday character. Millet is represented by eleven etchings, some of which are very coarse in execution, but nearly all have a value of their own, the finest is perhaps "Les Glaneuses"; "La Grande Bergère" is a remarkable treatment of a figure almost entirely in shadow. The splendid collection of Jacquemart's work carries us to the opposite pole of etching, the use of the most careful and refined execution in the illustration of plate, armour, drinking-vessels, &c. The brilliant manner in which this class of objects is represented by a method which might at first sight seem quite unsuited for such work is remarkable; notice especially the "Vase Antique" (46), the "Patine du Calice de Suger" (47) the "Vase Antique" (49) with a whole landscape reflected in it, the reflection following the sinuosities of the surface. It is not surprising to read that Jacquemart made full studies of these works in pen-and-ink or water-colour before commencing the etching; he could hardly have attained such certainty of effect otherwise. Bracquemond is the only living artist represented; his "Margot la Critique," a magpie standing on the globe and trampling literature and art under its claws, is a piece of vitriolic satire, showing also great spirit of execution, but Bracquemond is too much given to ugly and eccentric subjects. Of three very rough etchings by Corot, one shows a remarkable degree of aërial effect for so few lines. The only etching known to have been executed by Ingres, a portrait, forms part of the collection, which concludes with three of Meissonier's diminutive marvels of work. It is curious to contrast these with Millet's etchings on the next wall. The triumph of execution is all with Meissonier, but Millet goes far beyond him in feeling.

THE members of the Royal Academy, and their secretary, we presume never look at the calendar when they advertise the days for receiving works for their annual exhibition; or if they do, they appear to wantonly disregard both the customs of this country and the convenience of outside exhibitors. They have announced as the receiving days for paintings this year, Friday, Saturday, and Monday, the 27th, 28th, and 30th of March. The 27th is Good Friday, kept by the mass of the people as a holiday, and by a minority (more fittingly) as a sacred day; the 30th is a Bank Holiday, and the Saturday coming between these is almost everywhere kept as a holiday. Where are artists sending in pictures to find cartage and porterage on those days? Or why is the Bank Holiday of the employés of the picture agents, and of those of the Academy too, to be broken into, because the Council cannot take the trouble to inform themselves of the times and seasons? The arrangement of course does not affect the convenience of the Academicians, who have the indulgence of sending in their works a week later.

BYZANTINE ARCHITECTURE.*

BY PROFESSOR AITCHISON.

Byzantine Decoration.

WHEN Constantine the Great made Byzantium the capital of the Empire, Roman buildings were reproduced as well as they could be in a foreign town, and the decoration of them was that which was prevalent at Rome. We are too apt to think of Rome as a mud-built city with a few temples and public buildings of terra-cotta or stone, and the Romans as the simple and severe people of the early days of the Republic, when the great Generals lived in small farm-houses, wore a white toga, and tilled their land with their own hands. Just before the Punic wars (264-146 B.C.) there was but one service of public plate, which was lent to each Senator when he entertained foreign Ambassadors. You may recollect the remark of the Carthaginian Ambassador "that the Romans were the most good-natured people in the world, for though he had dined with each Senator separately he always saw the same service of plate." The influx of wealth, and the acquaintance with the magnificence and luxury of Greece, and of Oriental despots, very rapidly introduced the customs of Greece, Persia, and Egypt into Rome. Marble, which was at first looked on as a scandalous luxury for a private person, soon became the favourite lining of walls, though, so late as the first century B.C., M. Brutus called Crassus the "Palatine Venus" for having six columns of Hymettian marble in his house.

Sulla is said to have been the introducer of mosaic pavement, between 88 and 78 B.C., though his son-in-law Scaurus had, before that date, used glass for one of the stories of his temporary theatre. Personal adornment kept pace with the magnificence of houses, for Julius Cæsar had his shoes enriched with engraved gems! We know of the costly citron-wood tables of Cicero, and the gold and ivory ceilings of Horace's time. In the days of Augustus, an edict had to be promulgated to restrict senators to the use of the white toga on festal days. Seneca thundered against the luxuriousness of the baths, with their costly marble walls, their floors of gems, and their fittings of silver. Pliny, who died 79 A.D., wrote his diatribes against veneering walls with marble; and he tells us that mosaic had deserted the floors for the ceilings of rooms. Stained glass must, I think, have given additional splendour to buildings at an early period of the Empire. Even in Pliny's days, costliness was more admired than art, so that in magnificence and splendour the Byzantines could not exceed, but could only rival the Romans. Rome has been stripped so bare that we might fancy it to have been a plain city, but for written descriptions. There was, however, an invention that must have rendered the splendour of gold and silver much less costly, and, therefore, much more common at Constantinople, I mean the invention of gold and silver mosaic; the absolute date of its invention is, I believe, unknown. I may say that I did not find a single cube of it at Hadrian's Villa, nor in Caracalla's Baths, and these baths were not built till the third century. It is probable that gold and silver mosaic preceded those medallions, in which an etching on gold-leaf is preserved between two sheets of glass; these medallions, having portraits or symbols etched on them, bear evidence of their being of Christian times, so antiquarians believe them to be no earlier than the end of the third, or the beginning of the fourth, century. Specimens of the glass medallions may be seen in our national collections. Gold and silver mosaic is believed to have been used in Constantine's days, but I know not on what ground; the finding them in buildings of his day is no proof, unless it be confirmed by documentary evidence, and there is little or no evidence of the buildings in which they are found being of his time. There is a mosaic portrait of Flavius Julius Julianus in the Chigi Library that has several cubes of gold mosaic in the dress. It was found in the catacombs of St. Cyriaca in the Tiburtina, in 1656, and is believed to be of the second half of the fourth century; but there is nothing to prove that the gold mosaic cubes were not of a subsequent date. The passion for using metals, and particularly the precious ones, for decoration, seems to be inherent in man, and only to be interrupted when men or nations are wealthy, at periods of the highest cultivation. In the Bronze age, we read of the metal palace of Alcinous: "Meanwhile Odysseus went to the famous palace of Alcinous, and his heart was full of many thoughts as he stood there or ever he had reached the threshold of bronze. For there was a gleam as it were of sun or moon through the high-roofed hall of the great-hearted Alcinous. Brazen were the walls which ran this way and that from the threshold to the inmost chamber, and round them was a frieze of blue, and golden were the doors that closed in the good house. Silver were the door-posts that were set on the brazen threshold, and silver the lintel thereupon, and the hook of the door was of gold. And on either side stood golden hounds and silver, which Hephæstus wrought by his cunning, to guard the palace of great-hearted Alcinous, being free from death and age all their days .... Yea, and there were youths fashioned in gold, standing on firm-set bases, with flaming torches in their hands, giving light through the night to the feasters in the palace" (the Odyssey of Homer Lib. 7, lines 80 to 102, by Butcher and Lang. 8vo. London. 1887.)

It is not very clear whether the whole of the inside of Solomon's Temple was covered with gold, or only the oracle (I Kings, cap. 6, v. 20, 21, 22); but Polybius tells us that the palace at Ecbatana was covered with gold and silver (Lib. 10, cap. 27). "For all its woodwork being cedar or cypress not a single plank was left uncovered; beams and fretwork in the ceilings, and columns in the arcades and peristyle, were overlaid with plates of silver or gold, while all the tiles were of silver."

Suetonius tells us that Nero's Golden House had some parts overlaid with gold, and adorned with jewels and mother-o'-pearl. "The supper-rooms were vaulted, and compartments of the ceilings, inlaid with ivory, were made to revolve, and scatter flowers" (Suet. "Nero," cap. 31). Constantine Porphyrogenitus tells us

* Being the Fifth Royal Academy Lecture on Architecture this season. Delivered on Monday, February 9, 1891. (For the First, Second, Third, and Fourth Lectures, see pp. 82, 103, 123, and 144 *ante*.)

that his grandfather, Basil the Macedonian (867-886), built an oratory to the Saviour (No. 139) close to his apartment (Cenourgion) in the Sacred Palace, and says:—"The magnificence and splendour of this oratory are incredible to those who have not seen it, so great is the quantity of gold, of silver, of precious stones and pearls which are found amassed in its enclosure. The pavement is wholly of massive silver, worked with the hammer and enriched with nielli. The walls to the right and left are also covered with thick plates of silver damascened with gold, and heightened by the brilliancy of precious stones and pearls. As to the screen which closes the sanctuary in this house of God, what riches does it not combine! The columns are of silver, as well as the plinth that carries them. The architrave which rests on their capitals is of pure gold, loaded in every part with those riches which the whole of India can offer. One sees there, in many places, the image of our Lord, the God-man, executed in enamel. Language refuses its office to describe the splendid decorations of the sanctuary, and the sacred vases which it contains, as a place especially appropriated to the keeping of the treasures, and desires to leave them as things which nothing can approach; for, since speech can only remain below the subject, it is better to be silent. Behold, then, if I may say so, these Oriental beauties, which have gushed out from the bosom of the living faith of the illustrious Emperor Basil on to the works raised by his hands in the Imperial residence."

I have no doubt that the palaces built of gold and silver bricks, and covered with jewels, described in the Arabian Nights, were suggested by some of the splendid rooms or oratories of the Byzantine emperors. The means of decoration being metal, marble, sculpture, mosaic, and painting, I will now take the carving and marble. There was in the Early Christian Church a marked aversion to the use of figure sculpture in whole relief, and to statuary in churches, on account of the pagan idols being mostly in that form, but bas-relief did not seem to have been so much objected to. At first, too, there was an inclination to represent the Founder of the Faith by means of symbols, such as the lamb or the fish; but remains of angels carved in relief are found at Qalb-Louzeh, and there are figures in the caps of the columns of the narthex at "The Monastery-in-the-Country." Generally speaking, capitals of columns are carved with floral ornament only, except in the case of old Pagan caps, on which there are animals. The Mussulmans seem also to have had an aversion to figures in sacred buildings, as conducive to idolatry, so what with the original objection to figures by the Christians, the fury of the Iconoclasts and the puritanism of the Mussulmans, little figure sculpture is found in the Eastern Churches. This must have been a severe trial to the sculptors who had turned Christian, and who were surrounded by the masterpieces of ancient sculpture and statuary, though Constantine had all the fountains he built carved with these two subjects, viz., "Daniel in the lion's den," and "The Good Shepherd." Sculpture for secular purposes was still used in Justinian's time, for Procopius tells us that the sculptors and statuaries of Justinian's days produced such excellent statues that they might be taken for the work of "Phidias, the Athenian, of Lysippus of Sicyon, or of Praxiteles." He tells us of the bronze equestrian statue of Justinian in the Augusteum, and one of the Empress Theodora, in the court of the baths of Arcadius; he says:—"The face of the statue of Theodora is beautiful, but falls short of the beauty of the Empress, since it is utterly impossible for any mere human workman to express her loveliness, or to imitate it in a statue." I presume the sculptors eventually turned ivory carvers, for in this material figures do not appear to have been objected to. The capitals of the columns, when not pillaged from ancient buildings, generally affected the cubic form, like those of Constantine's cistern, called the Thousand and One Columns (see photo), or that of the plan of a Corinthian cap, with a convex instead of a concave outline; the whole capital was generally covered with fine pierced floral ornament. There was a great inclination, even in late Roman days, to make all floral sculpture like filigree work.

A few well-known examples of capitals are exhibited. The plan of decoration was, as I have said, practically the same as the later decoration of Rome; the columns were of choice marble monoliths, with carved capitals; the walls were lined with thin slabs of various coloured marbles, mostly arranged in panels with borders. Sometimes the borders, and sometimes the panels, were carved with flat carving; and sometimes the borders, and sometimes the panels, were of inlaid marbles, now called "pietra dura." There were carved cornices, strings, door, and window heads, while the vaults, arches, and domes were covered with mosaic. The marble linings have been stripped from the walls of Roman buildings, and it is only here and there that we find a bit of marble in an angle, held on by a clamp, or by the floor mosaic. Monolithic shafts, and their carved caps we still find; we also find floor mosaics, on account of their being covered by the rubbish when buildings were pulled down, or fell down after they were abandoned; of glass mosaic we find nothing but the cubes amongst the rubbish, excepting a few coarse rustic works like the faces of fountains at Pompeii. But Rome had been stripped when the capital was changed to Constantinople, and again when paganism had been abolished; it had been perpetually overrun by hordes of savages, and it has also suffered at the hands of the builders, after the revival of learning. I mention this because we have now no means of comparing the arrangement of the marbles on the walls of Byzantine churches with those of Roman buildings. The church of St. Demetrius, at Thessalonica, is a two-storied arcaded basilica, with clerestory windows above, and is covered with a timber roof. The nave between the bema and the narthex is divided into three compartments by piers, and between the piers there are, in the middle bays, four columns of verde antique, and three columns of other marbles in the two other bays. Some of the columns have old caps, too small for the shafts, and some caps are Byzantine; there are also two verde antique columns to the narthex. Each verde antique column in the centre compartments of the nave stands on a short pedestal about 2 ft. high, showing that the shafts had come from older buildings; they have classic bases, but the shafts themselves have the wide fillet under the apophyge, which is characteristic of Byzantine shafts. None of the other columns have pedestals. Above each capital is a block, apparently the survival of the entablature; some of these blocks are carved, and some have only a cross. The lower arcade has Corinthian or composite caps, and the upper arcade Ionic ones; between the columns of the nave was once a solid moulded balustrade, many pieces of which are now used as paving, and there is also one side of an ambo, now used for the same purpose; a similar balustrade to the upper arcade still remains. The whole surface of the walls is covered with slabs of marble.

Under the bases of the upper arcade, a cornice is represented in pietra dura. Beginning at the top there is a green strip between two white ones; below that is a strip of red marble for the corona; below this, plain square cantilevers are represented in perspective, capped with a bead and reel, and a dentil band; the soffits of the cantilevers are red, with a white side and end, the latter has a black panel in it; between the dentils, and for the soffit of the corona, red marble is used, and black for the cantilever band, with a white star in the centre of each space; in the middle of each pier the cantilever is turned the reverse way, and the square piece between the sides is filled in with black, with a white star, and the spandrel piece at top is also black with a white honeysuckle. Below the cantilever band is a white band, and below that is a red one, which completes the cornice. In the spandrels of each of the arcades, below the cornice, there is a square panel, whose bottom touches the extrados of the arches, inlaid with coloured marble in geometric patterns. The whole church inside has a distinguished air.

At Sta. Sophia, Constantinople, there is a broad band of verde antique above the skirting; above this are four bands of light marble dividing the height into short spaces at the top and bottom, and a longer one in the middle. Above the cornice is a band of verde antique, and then one band of lighter marble divides the spaces into a long lower, and a shorter upper division, above which comes the pietra dura work. In the lower part, the centre panels have stiles and rails; these are first marked out by projecting slips of white marble, with the Venetian dog tooth on the face, and the stiles and rails are carved, the panels being of porphyry, verde antique, or some other precious or effective marble. The same thing occurs in the lower panels of the first-floor, only the stiles and rails are not carved; in the upper and lower panels of the ground-floor, and in the upper panels of the first, the panels are only separated from the ground by one line of white marble, with the Venetian dog-tooth going all round them: some are filled with strongly-veined marbles, placed so as to form vertical squares in the middle, with zig-zag sides, and some have horizontal zig-zags. The variety of precious marbles used is quite extraordinary; they are all mentioned in the poem of Paul the Silentiary and through the kindness of Mr. Brindley are here exhibited. As I said before, the sea air and the dust have given a uniform dusky colour to most of the marble, like that I showed you from Salonica, though the white, the purple porphyry, and the verde antique still show their colour distinctly. There is an effect of subdued magnificence about the marble work, but I have no doubt the effect would be better if the marble work were repolished, provided that there is no streaked rosso-antico; this has wide streaks of the colour of a raw steak, with livid white between: as a rule each block is cut into four slabs, and so put together that the four diagonal streaks make a symmetrical panel. Some years ago I saw parts of San Vitale that had lately been repaired with streaked rosso-antico newly polished, and the effect was glaring and ghastly.

At Constantinople, the Kalendar mosque, and the church of the monastery in the country, have their walls treated in the same manner, only at the Kalendar mosque much of the marble is replaced by coarsely-painted imitations; at both these churches there is some lovely Byzantine acanthus, carved in white marble, and pierced right through—some of the loveliest work I have ever seen. The difference between these two churches is this: one now looks magnificent and the other looks as if it had once been so. There is a veined marble screen in the southern gallery of St. Sophia, supposed to have formed the Imperial pew for the Empress Theodora, her maids of honour, and perhaps her court, but, as far as I understand, it was on certain occasions used by the Emperor, who afterwards descended by the wooden staircase (No. 13), and I do not know if Theodora sat with him. We know that the coronation took place in the ambo, and that the Emperor had a seat in the solea, the vast E. hemicycle, and in the bema as well.

The screen now consists of two imitation doors, in two leaves of veined marble, with a wooden door between them. Each pair of marble doors has an architrave round it; the two leaves are shut against a narrow pilaster, enriched with ornament, with a capital and base. Each leaf has five panels in height. Two panels out of the five have large plain bolection mouldings, and no ornament except a bead and reel, and the three others have the bolection mouldings enriched with the *raie du cœur*. The stiles and rails are moulded, and stopped at the centre of each panel both ways, and in the blank space between the stopped ends are bosses, except opposite the middle of the third panel in the shutting stile, where the rings for opening the doors are carved. The screen is capped by a square ornamented band. On one side the Imperial eagle remains. The late W. Burges used to be emphatic on the importance of this screen, as showing what wooden doors were like in Justinian's time; there is a photograph exhibited of this screen. A drawing is exhibited of the two leaves of a door, now used as jamb linings, at Μονή τῆς χῶρας (see lithograph), which are much more effective than the doors before described, but of similar treatment, except that the panels were once sculptured with figures, which have been chipped off. There are the remains of the carved rings which were evidently in lions' mouths. In this church was once a portrait of the Virgin, attributed to St. Luke, and these doors might have enclosed it. The holy robe of the Virgin was alternately kept here and at the church called Hodegetria, and these doors may have closed in the cupboard where it was kept.

It is hardly necessary to speak of "pietra dura," as it is so well known; it is merely inlaying one marble with another, so that beyond the excellence of workmanship, there is nothing but the design and the harmony of colour to speak of. That at Sta. Sophia is

admirable, and consists mainly of black and white, enlivened by pieces of green and red porphyry here and there. "Pietra dura" might now be used with great effect in sumptuous modern buildings, especially when near the eye.

Mosaic is believed to have taken its origin from floors or paths being paved with little pebbles of different colours, and this sort of mosaic might be very effectively used now. Hamdy Bey, the Director of the Imperial Museum, and the discoverer of the magnificent sarcophagi at Sidon, has a house beyond Pera, on the Bosphorus; the garden paths are ornamented with a floral pattern in black pebbles on a ground of pale yellowish-brown ones, and it certainly looked very quaint and pretty.

Mosaic certainly bore the name expressive of its origin up to the eighth century, for in the treaty made between Walid and the Roman Emperor it was called ψηφοις, and may bear that name still in Greek, Arabic, and Turkish. According to Pliny, it was introduced from Greece by Sulla, who used it for the pavement of the Temple of Fortune he built at Prænestе. Pliny says :—"Since his time these mosaics have left the ground for the arched roofs of houses, and they are now made of glass." The most celebrated pavement mosaic of antiquity is that of the battle of Arbela, when Alexander the Great finally overthrew the power of Darius. This mosaic was found at Pompeii, and it could not, therefore, have been later than the first century. Pompeii having been destroyed in 79 A.D., this mosaic is supposed to be a copy of a picture.

Most exquisite specimens of floor mosaic, as far as workmanship goes, have been found in Hadrian's villa at Tivoli, composed of fine stones in minute cubes. I have said nothing of the pavements of Byzantine buildings, for the very obvious reason that every mosque is covered with carpets or matting, so you cannot see the paving; but I believe it is generally the superb Opus Alexandrinum work, principally composed of purple and green porphyry let into white marble; but beautiful as marble mosaic is, it does not equal the force and splendour of that composed of glass cubes, and when this has a deep ocean blue ground it is the most magnificent of all decoration, except stained glass.

I told you before that the exact date of gold and silver mosaic is not known. Supposing St. George at Salonica was built by Constantine, and the mosaics are co-eval with the church, there is perphaps no mosaic left that is so splendid.

The Bema is said by Texièr and Pullan to be at the East end, another argument for the church not being of Constantine's time.

In classic days, with the exception of portraits of the Emperors, or of private persons, the only titles to representation were being gods, physical beauty, and intellectual eminence. Gods, goddesses, nymphs, and demi-gods, were pourtrayed as the most perfect specimens of human beauty; for intellectual attainments there were lawgivers, philosophers, poets, conquerors, and statesmen.

Christianity changed all this; physical beauty was rather looked upon as the "sign of the beast." The forms most affected were those of saints emaciated by fasting, privation, suffering, and neglect, with their intellectual faculties almost extinguished by loneliness, vigils, and despair.

Byzantine pictorial art was, as it were, the mingling of these two streams of the Classical and Christian ideals. The Byzantines were too much imbued with the Classical spirit, and were too much encompassed with the masterpieces of Classic art, to be wholly devoted to the Christian view, not to speak of their instincts as artists, being in revolt against the pourtrayal of disease and deformity; so if we get an emaciated saint, we generally get some plump angels to complete the composition.

To return to St. George at Salonica. The zone of the dome on which the mosaics still remain is divided into compartments by mosaic ribs, and each compartment is filled with two or three saints in front of an architectural background; the ground and the palaces or churches, are all of gold; the architecture is made out by being edged with colour, and having coloured friezes, bands, and ornament upon it. Each building is a golden house indeed.

The curtains with which all the openings are furnished are looped up, and are mostly of light tones and lively colours, bright peacocks and grey peahens, storks and cranes, perch on the roofs; in some cases pendent lamps are shown in each of the arcades. The saints or martyrs are in coloured tunics and togas, with bare heads and hands, though in the case of old saints it is difficult to say whether it is their white hair or a white skull cap that is shown. They are supposed to be lifting up their hands in prayer.

One compartment contains three figures, viz., Therinos in the centre, Philip on his right, and Basil on his left; they have dark grey tunics, and pale blue togas, shot with pink, Philip has a white dalmatic; the floor on which they stand is gold. In another compartment Romanos and Eucarpionos stand right and left, on each side of an apse, the pavement is of grey slabs, with a darker stone in the middle of each. In another compartment, Onisiphoros and Porphoirios stand on the right and left of an apse, with a ciborium in the middle between them; the floor is gold. In another Kosmos and Damianos stand to the right and left of a circular ciborium, with three carpeted steps, light green curtains, two thirds of the height of the columns, enclose it, and the hollows between the loops of the curtain and the golden rod are scarlet. These saints stand on a grey floor, the greater part of which is in shadow. The vaults of the chapels are also covered with mosaic in patterns, some having silver mosaic and some have birds in the panels.

Perhaps the finest mosaics are to be seen at Ravenna, in the tomb of Galla Placidia, the daughter of Theodosius the Great, who was once a Queen, once an Empress, and twice a slave. The tomb is cross-shaped, and the arms or transepts are covered with deep blue mosaic, and on this are magnificent ornaments and figures in gold. Some of the blue mosaic in this tomb is the colour of a peacock's neck. Galla Placidia died in 450, and I suppose her corpse was embalmed, for it is related that her body was placed in the tomb seated on a chair of cypress-wood.

In St. Apollinare in Classe, of the sixth century, there is a most charming mosaic in the apse, with lambs in a meadow. The most stately and monumental mosaics are those in St. Apollinare Nuovo; on each side of the nave are friezes, the one on the north side shows a procession of twenty-two virgins, with the mitre on their heads, carrying crowns in their hands to the Virgin and child at the east end; behind them is a grove of palm-trees; on the south side at the west end is the town of Ravenna, with Theodoric's palace, and then follows a procession of twenty-five saints holding crowns and receiving the benediction of the Saviour, who is sitting on a throne; in this church is found a mosaic portrait of Justinian.

San Vitale has the most lovely mosaic ceiling over the sanctuary I have ever seen. The ceiling is groined and the four compartments have the ground counterchanged. The east and west compartments have dark green foliage on a gold ground, and north and south have olive-coloured foliage edged with gold on a ground of green turquoise; in the scrolls are all sorts of animals; in the centre of each compartment four winged angels stand on azure balls and support a circle of leaves, containing the Lamb, on a deep blue ground studded with gold and silver stars. There are also other fine subjects in the Sanctuary, notably Justinian and Theodora opening the church. Some of Theodora's ladies-in-waiting are clothed in tissue of gold enriched with jewels. The Empress is crowned, and in the Imperial purple. On the bottom of her robe the adoration of the Magi is embroidered in gold. She has strings of pearls from her head-dress hanging down to her shoulders. The nimbus in those days is said to have been an emblem of power, rather than of sanctity, for she has it.

I am indebted to Mr. Oppenheimer for a study of another fine mosaic in San Vitale (exhibited).

Procopius (Lib. I., cap. 10) gives a description of the mosaic in the vestibule of the Imperial Palace of the Chalce:—"The entire ceiling is decorated with paintings, not formed of melted wax poured upon it, but composed of tiny stones adorned with all manner of colours, imitating human figures and everything else in nature. I will now describe the subjects of these paintings. Upon either side are wars and battles, and the capture of numberless cities, some in Italy, and some in Libya. Here the Emperor Justinian conquers by his general Belisarius; and here the general returns to the Emperor, bringing with him his entire army unscathed, and offers to him the spoils of victory, kings, and kingdoms, and all that is most valued among men. In the midst stand the Emperor and the Empress Theodora, both of them seeming to rejoice and hold high festival in honour of their victory over the kings of the Vandals and the Goths, who approach them as prisoners of war led in triumph. Around them stands the Senate of Rome, all in festal array, which is shewn in the mosaic by the joy which appears on their countenances; they swell with pride, and smile upon the Emperor, offering him honours as though to a demi-god, after his magnificent achievements. The whole interior, not only the upright parts, but also the floor itself, is encrusted with beautiful marbles, reaching up to the mosaics of the ceiling. Of these marbles, some are of a Spartan stone equal to emerald, while some resemble a flame of fire: the greater part of them are white, yet not a plain white, but ornamented with wavy lines of dark blue. (Procopius, the buildings of Justinian, Lib. 1, cap. 10.)

In the last lecture I gave you Constantine Porphyrogenitus' description of the mosaics in the Cenourgion, built by his grandfather, Basil the Macedonian.

There are some lovely ornamental mosaics in the narthex and the upper galleries of Sta. Sophia. Those in which the harmonies are got mainly by deep blue, silver and green, with a little gold and red, are, to my eyes, the finest. The figures have been mostly obliterated by painting or gilding over them, though in some cases a faint outline of them can be seen. Christ, the humble shepherd, with a crook, and a lamb in his arms, became later an Oriental potentate clothed in magnificent apparel, and sitting crowned on a golden throne. In spite of Byzantine art getting ossified by ecclesiastical interference, the Byzantine artists did keep for a long while the Classical traditions, and certainly learnt the art of monumental decoration. The simple and more primitive rules were always kept in view, dignified repose in the figures, and almost absolute repetition. I saw very little of late mosaic in Greece, it was not only nearly dusk at Daphne but the church was boarded up for repairs, but we have here most beautiful and careful drawings of its mosaics by Messrs. Schultz & Barnsley, and of other mosaics in Greece, &c. Some of the subjects in the narthex of Μονή τῆς χώρας, all in mosaic, are quite Classic in the folds of the drapery, and some is beautiful in colour, almost like a piece of blue-vert tapestry on a gold ground; the rubbing of the head of St. Paul is lent by Professor Lewis; these mosaics are said to have been executed in the reign of Andronicus II. (1282-1328).

You must recollect that Constantinople was at one time a pefect museum of the masterpieces of ancient art; the Hippodrome and the Augusteum were full of them, and there can be little doubt that these masterpieces were studied by the mosaic workers and illuminators. The great difficulty is to tell the age of illuminated MSS., for the illuminators were very fond of copying subjects from the old MSS. and from old mosaics. There are often to be found traces of old classical compositions, both in mosaic, and in illumination. At the Baptistery at Ravenna, there is John the Baptist on the bank, and Christ in the Jordan. This is not only shown as water, but is personified as well by a river-god with an urn and I O R D written over him. The MS. of Joshua in the Vatican, said to be of the seventh century, has many illuminations that are quite classic in treatment. Isaiah between night and morning from a psalter looks like a classic picture; it is now in the National Library at Paris, and is said to be of the ninth or tenth century. There are the remains of a few painted figures in the North Church of the Monastery in the Country; one could not judge of the general effect as decoration, as the bulk of the walls were whitewashed, and, besides, I am not a painter.

I beg to remind any painters here present that there is a great future in store for them, in the two great popular arts of glass painting and mosaic. I say popular, because large examples of these arts are more seen by the people at large, and more appreciated by them than what is looked upon as superior work.

I know that glass is not only a transparent medium, but when used for windows is meant to let in light, so that in this respect it is false to nature, but it admits of form, composition, and colour, and as regards this latter, the transcendent loveliness of good stained glass in sunshine, is not only sufficient to excuse all

other faults, but is to me the most heavenly form of beauty.

Titian said of mosaic:—"It is the true painting for eternity," but from an architect's point of view it is wanted as the decoration for a building, and not as a bad copy of a picture in oil. I am deeply thankful to all living painters for preserving for my delight the beautiful landscapes, scenes, and persons of the day, and for showing me beauties I have not seen, which have been created by their imagination, and to the past painters for preserving the beauties of former times; and there is no doubt that for certain delicacies of colour, and for certain qualities of texture, oil painting is supreme, but it is rarely so decorative in buildings as stained glass or mosaic. Pictures are transcripts from nature, either directly from things seen by the eye of the painter, or evoked by his imagination; they are entities of themselves, and transport the beholder to the places they represent and to the period of the actions they portray. They present other scenes or other periods than those immediately surrounding the beholder; they appeal forcibly to his imagination, and transport him elsewhere. I ask myself is this the true decoration of a wall or a ceiling? This wall or this ceiling is not only a necessity but a patent fact, and it seems only to ask to be made beautiful to look on and to require a certain amount of conventionalism in its treatment. From a painter's point of view, the exchange of this prosaic reality for some poetic vision may be looked on as an inestimable gift; the magic of his brush has annihilated the reality. Instead of a wall I see,—

> "The maid-mother by a crucifix,
> In tracts of pasture sunny-warm,
> Beneath branch-work of costly sardonyx."

But as an architect, I do not want my wall or my ceiling transmuted; I only want it to be as beautiful as possible, and really the doing this affords the means of showing purity of outline, masterly composition, and certain broad qualities and harmonies of colour. It by no means excludes figures, it only excludes pictures, and I contend that the rigid lines of architecture, tend to give style to the pictoral composition that is put upon them. White marble statues and bas reliefs are from their colour equally fatal to all full-coloured decoration. I hope to see the backs of all our porticoes filled with mosaic, and all pediments and niches full of sculpture. I must also say to those painters who wish to work in stained glass or in mosaic, that they must do much of it with their own hands, for I believe that we shall never get either art, perfected by cartoons made in a studio with the work carried out by mechanics. It is essential to know the material, and to learn the art of producing the required effect in the spot intended, and this spot is often high up and peculiarly lit. Enamelled brick or pottery is another means by which our dismal, smoky streets may be made lovely and resplendent with colour. The health of the inhabitants would not only benefit by the smoothness of the surface, and the ease with which it could be cleaned, but by the beauty of the design and of the colour.

What a fascinating vision it is to see London, and all the great manufacturing towns, changed from dismal, sooty cities to those in which every building is full of colour and artistic composition, made lovely by light and delicate or deeply-coloured harmonies, or resplendent with gilt bronze, polished granite, porphyry, and glass mosaic.

MARBLE AND MOSAIC:

THE ARCHITECTURAL ASSOCIATION.

THE usual fortnightly meeting of this Association was held on Friday, the 20th inst., in the meeting room of the Royal Institute of British Architects, Conduit-street, Mr. Leonard Stokes, President, in the chair.

On the motion of Mr. F. R. Farrow (Hon. Sec.), a vote of thanks was accorded to Messrs. Perry & Reed, the architects, and Messrs. Hobbs & Co., the builders, for allowing the members to visit the new buildings now in course of erection between the Strand and the Victoria Embankment, on Saturday the 21st inst.

It was announced that the next visit would be made this Saturday, the 28th inst., to St. Philip's Church, Stepney, by the kind permission of the architect, Mr. Arthur Cawston. (We gave a description and several illustrations of this church in the *Builder* for October 11, 1890.)

Mr. W. E. Sanders was elected a member of the Association.

The Chairman then said that as the members were aware, they were to be favoured with two papers that evening on the interesting subjects of marble and mosaic, by Mr. T. R. Spence and Mr. Gerald C. Horsley. He would first of all call upon Mr. Spence to read his paper.

Mr. Spence's Paper.

I do not propose to enter into any historical details as to the first and subsequent application of mosaics.

In a general sense we understand mosaic as a combination of various more or less imperishable materials—fixed together by cement or other adhesive substances—and laid over walls, floors, &c., with a view to permanent decorative effect. The substance of the tesseræ is of many kinds,—namely, glass, cheap and precious marbles, hard stone and burnt clay,—those last-mentioned being mainly in use for architectural purposes.

For decorative schemes we collect as many gradations of colour as are obtainable in such durable materials in their natural or manufactured state, and thus form a colour palette which we regard in the same sense as a painter would his pigments.

Of course the first proceeding is to prepare a design on a small scale, which should embrace one's notions of colour only. Then follows a full-sized cartoon, which I need hardly add should embrace one's best efforts in drawing. A tracing is made of the latter and transferred to sheets of cardboard. This cardboard is cut to the size of certain sections of the design, and, for convenience, should not be more than, say 20 in. sq. Of course it will not always be square, but will bear the same relation to your complete cartoon as a map of the counties would to that of all England. Now, working from the small design (of colour), the tesseræ are cut to the forms required, laid face downwards, and glued on to the cardboard sections containing the enlarged cartoon. When the design is all worked out on these sections they are ready for fixing on to wall or floor by laying them home on a float of cement. When the cement sets, the cardboard sticking to the face is washed off, and the joints of the tesseræ flushed over with cement and cleaned off, leaving all joints filled up level.

There are other processes used for the same end. The technical processes need not occupy our attention at present.

There is one process that may appeal to you, and that is executing the work *in situ* by floating-on a limited expanse of cement, and sticking on the tesseræ at once. It has the advantage of enabling the artist or architect to see the effect of his efforts under the fixed conditions of light and height.

I shall confine myself to vitreous or glass mosaic, which for durability, extended scales of primary colours, and their numerous semi-transparent gradations, is unequalled by any substance yet used for wall or floor decoration. I am surprised that having all these fine qualities, it is not more used by architects. If you require proofs of its triumphs go to St. Mark's, Venice, and stand under its mellow golden roof. There you will find its domes and vaulted aisles, nave and transepts, entirely overlaid with gold mosaic, into which ground is worked—in the deepest and richest colours and their gradations that contemporary manufacturers could produce—subjects selected from the Creation down to the life of Christ, in addition to containing a complete alphabet of early Christian symbolism. The roof surfaces, being one succession of over-arching curves, become receptive of innumerable waves of light and broad unities of soft shadows, giving the whole an incomparable quality of tone and a low juicy colour.

Never use your gold but on curved or undulating surfaces. Flat planes of gold only give the effect of a monotonous metallic yellow, and can never be beautiful, owing to the absence of the variations that come with waves of shadow.

By letting out the reins of imagination we might feel that in St. Mark's a tenth century Giorgione has given off the mental impressions of all the golden autumns of his life. His material gave him an advantage over his great followers of the fifteenth and sixteenth centuries, insomuch that glass has a living and glowing quality of light not existing in the somewhat clouded purity of oil-paint, or fresco.

In St. Mark's we have an example of the superb treatment in deepest and most Titianesque scales applied to curved forms; but to find a similarly complete example of the use of lighter tones and on flat surfaces, we must turn to Ravenna.

I can give you no adequate description of the wall-mosaics of Ravenna. In the sense of delicate colour, they remind me of some of the subtle harmonies of some of the finest works of the modern French school,—of the impressionists and others who combine that quality with a true instinct for design. In standing before them you feel that the Dagnan Bouveries, the Mersons, the Cazins, the Puvis de Chavannes, &c., of the fifth century have had a hand in the conception and realisation of the beautiful compositions to be found in the nave walls of the two churches of St. Apollinare Nuovo and St. Apollinare in Classe. Here, all the scales are of delicate degrees of light tones, supreme in their beauty, completeness, and, most important to us, their true decorative instinct. In the Baptistery we find what I may term a third essay in colour, by weaving in rich, dark, and glowing colours on figures and bold sinuous forms of ornament in such a skilful and judicious manner that the whole dome seems to be alive with harmonies although they are mostly primaries.

As you know rules for the disposition of colour are futile, yet some details that struck me as eminently satisfactory may interest you. In all cases the tesseræ are of small dimensions, about a quarter of an inch square. The stucco joints are large and open surfaces, far from level but undulating considerably. The tesseræ stick up in parts, brilliant edges showing. Absence of flatness gives play to the light. The grey of the stucco joints brings the whole composition together, serving as cool greys in a picture to give tender unity.

Gold, apart from backgrounds and large surfaces, is used very cleverly in small pieces in borders of garments, and more especially in thin outlines to make out the drawing and certain flowing forms of ornament. Brilliant pieces of glass actually moulded at the kiln into forms of jewels add brilliancy to crowns, borders, &c. These stick boldly out from the surface.

I noticed in the Baptistery, below the springing of the dome, a frieze about 2 ft. 6 in. deep, having the ground entirely in black, through which was woven in thin gold lines a delicate foliated design. This, in conjuction with the upper surfaces in dark, rich colour, had a most delightful effect.

We, as students, will learn most from the Ravenna examples, for great are the needs of light and silvery colour in this country, where grey and gloomy days far outnumber those in which the sun gives liberally of his light.

I may say, in passing, as our subject is really a matter of decoration, that all our nineteenth century efforts in this direction are all of a somewhat gloomy tendency.

We fill our rooms with imitations of sombre Spanish leather, stain and paint our woodwork in leathery and muddy tones, to arrive at what is now a sort of decorator's god. Quaintness is the name of that god. Many are the sins for which he has to answer. Had we not better worship a deity called Beauty, whose place is a little higher up Parnassus?

Why should we not in our endeavours attempt in some measure to transfix the brilliant harmonies that follow the sun in his liberal and gracious course?

This muddy quaintness is certainly pleasant for brief periods, when lamps are low and firelight gilds and deepens its parts. Turn the sunlight on these so-called triumphs of the modern decorator's art, and then you feel the lack of many a phase of colour that might have been borrowed from the thousand and one examples that in nature he vivifies and makes brilliant.

Referring again to the Ravenna mosaics, I can only add that at the present day an extended palette of coloured grass is available. The technical difficulties are not great, and there is no question as to the fine qualities of design and colour that are to be obtained in this material.

The great point in this, as in all other schemes of decoration, is the art, the mental quality of conception, and the sense of colour and fitness. If we hold the precious heritage of an artist's mind,—that divine and rare something which gives form, colour, and completeness to a story, a dream, or a vision,—then very

little difficulty follows in making vitreous mosaic a valued servant in the realisation of a fine creation.

It is the function of the architect to design suitable spaces for colour decoration, bounded by dignified mouldings and other details of his constructive art in such a manner that the addition of decorative colour shall in no way mar the scheme of his complete work, but shall (under these well-ordered distributions) have set on it the seal and crown of colour which is inseparable from a perfect piece of architecture. In such spaces he may dream his dreams, tell his stories, and stamp on them for centuries his subtlest and divinest thoughts.

May I not urge that to such spaces must be given the best that is in you, for once placed so shall they remain unchanged through generations, time being powerless to add any mellow garment of tone or softening quality whatever?

I mistook the title of the subject in thinking that it was mosaic only, and at the last moment found that it was "Marble and Mosaic."

However, the same dominant principles underlie the treatment of marble. It is a question of the finer instincts for form and colour.

In recent years, the demand for choice decorative materials has been the means of opening out many marble quarries all over the world. Transit being easy, a large scale of varieties is available. One fine addition is the Mexican onyx.

My feeling is that the most beautiful marbles are those where the soft and sinuous veins melt and die into the general body, comparatively sharp markings dying away at the edges into innumerable gradations. Marbles having strong and hardly-marked veins present great difficulties in distribution. If they are near, they offend you with their coarseness; and, placed at a distance, the hard vein lines have very little decorative value. I should say, use these in narrow slips, with very little moulded profile, or as parts of *intarsio*.

Mouldings should be specially designed for different marbles,—I should say mainly on the principle of sudden contrasts,—that is, large members with very little curve bounded by members very small in detail, thus obtaining sharp lines, having little surface to be influenced or distorted by the veined markings, and serving to sharpen up and give form to the broader members (which show the colour qualities of the marble), much as you sharpen up an ink drawing by underlining.

These small members serve the architect's purpose for the expression of vertical and horizontal lines, and where decisive and cutting shadows are required in the composition of his work.

If delicate carving forms part of your design, I should say statuary is the best, as in it you have no veins to distort your detail.

I need hardly add that economy should be studied in using precious marbles, without injuring the durability of the work. Contours may be built up in thin sections.

Intarsio is a beautiful form of treating marble on an inexpensive ground. Gem-like effects may be obtained by inlaying with smaller pieces, following such ornamental forms as your inventive brains shall dictate. Perhaps the pocket of your client will be the chief dictator.

Heraldic emblazonings inlaid in marble are highly effective. The conditions of the heraldry necessitate the use of many varieties, but in such small quantities that on a large simple field they are rarely out of harmony. In addition they map out a large and interesting variety that will save the worry of creation of designs coming entirely from your own brain, and you know the worry of an architect's life makes him hail with pleasure at times a rest from the strain of creation.

This heraldic work may be seen to perfection in the chapel of the tombs of the Medici at Florence.

At the Pitti Palace are some tables which you may know where marble *intazzio* can no further go.

Alabaster does not appeal to me; it is somewhat sugary in results.

If you are fortunate enough to have a sculptor who is a sort of nineteenth-century Donatello, let him work his will on statuary or such restful marble.

The celebrated monument in the Church of Santi Giovanni e Paolo, at Venice, which Ruskin says is the finest monument in the world, is, if my recollection serves me correctly, in white marble, and its beauty comes entirely from the sculptor's art.

Such monuments give you much better than any words of mine ample suggestions for marble treatment.

I may quote such names as Nicolo Pisano and Verocchio.

Photographs of some of their work I have brought. Note Pisano's beautiful white altar at Bologna, and Mina de Fiesole's work in Florence. They all show the sculptor as supreme. Why should not we encourage individual young sculptors more? Give them portions of your work in which they can put all the fervour and enthusiasm of young manhood. Their powers may not be ripe, but they possess a *verve* and intensity that may have for ever fled when in later years the imagination is less enthusiastic and the pulses slower. I am sure there are many young sculptors now wanting commissions who have been trained at the Academy, and better still, in the best French schools. I maintain that the contemporary French school of sculpture is in its line equal to any school of sculpture that has ever existed, not excepting that of Pheidias or that of the Italian Renaissance of the fifteenth and sixteenth centuries. I believe history will confirm this. Why not give these men an opportunity and help on the movement to found a truly English school of sculpture, rather than give all such work to trading firms of carvers, who will do you any number of superficial feet, properly priced and scheduled (and in the bills of quantities), of any style you please, from Prehistoric to Victorian Gothic? Of course, this is our British way of founding a great school.

There is one method of treatment that appeals to me very strongly, and that is, the application of coloured metals to marble, more especially bronze and copper. I may quote as a successful example the Wellington Memorial at St. Paul's. Another suggestion of what might be done in the way of bronze panels is suggested by the Fawcett Memorial, by Gilbert, in the west chapel at Westminster Abbey.

Mr. Horsley's Paper.

I am sorry that neither time this evening or a proper capacity for treating the subject properly will allow me to speak with anything approaching real justice on the subject arranged for discussion to-night. The title of this subject is, I believe, "Marble and Mosaics," but I can, of course, only speak a very little of marble where the use of it comes in immediate connexion with mosaic; and, through the kindness of several friends, I am able to show you some illustrations of the use of marble and mosaic in Italy, Sicily, Greece, and Egypt. We have many instances of the most beautiful use of marble in England, but this is a large subject by itself, and, as I read the title of the paper, we are only to-night considering marble and mosaic in juxta-position. I am anxious to-night to touch a little upon the modern uses of mosaic, but, before doing so, perhaps I should refer to the illustrations and photographs Mr. Spence and myself have brought down with us.

St. Mark's at Venice, the Capella Palatina in Palermo, the Cathedral of Monreale, and some churches in Greece and Constantinople, and indeed throughout the East, present to us some of the finest combinations of marble and mosaic known to us. Unfortunately, but few remains of such combinations remain of the Greek and Roman periods. These photographs and drawings will show you what wonderful works have been performed by the Eastern artists, for I need hardly remind you that St. Mark's at Venice was built by Byzantine architects, just as the Capella Palatina and Monreale were built by Saracens, though nominally by Normans who had made Sicily their kingdom and home. In Sicily, the marble is almost always of beautiful cippolino, that exquisite creamy white marble with green veinings. In St. Mark's no cippolino is used, but green and red marble; nor are the slabs in St. Mark's so regular in size as in the Sicilian churches. You will notice how beautifully arranged the marble is in these, with its borders and divisions of gold and glass mosaic, compared to the wall-linings in St. Mark's.

The builders of St. Mark's were not, of course, of the same mould as the Saracens. Both carried out their work as it seemed best to them, for both builders were artists. At the same time, judging partly from appearances, it would seem that the Sicilian marbles were specially prepared for their position, while those in St. Mark's appear, in some cases, to have been taken from more ancient buildings and adapted to their present position. No doubt marble and precious stones were transported in classical and mediæval times from country to country for the purposes of art. But still more constantly the workmen used the materials they found on the spot. We find, for instance, the Romans in Britain using limestone and chalk, Purbeck and ordinary stones of various colours for their floors, and in Carthage and Hallicarnassus, where marble naturally abounds, they used marble. (Portions of the latter mosaics are now in the British Museum.)

The Italian workmen, too, who laid the Opus Alexandrinum pavement in Westminster Abbey used stone where they would have used marble in Rome.

The most ancient piece of floor mosaic known is a small piece at the Temple of Zeus at Olympia. M. Laloux, the French architect, has lately published a work on Olympia, in which he shows this mosaic restored, showing it most elaborately, but I believe the only portion which really remains is a representation of a Triton and dolphins. I understand, though, from a friend who has lately been in Greece that this mosaic is formed by differently-coloured pebbles, and is not of cubes of marble or stone at all. Other examples, but of later date, of this pebble mosaic have been found in Greece.

I am indebted to Mr. Arthur Bolton for these tracings of Roman mosaics made by him at Pompeii. He first took rubbings of the mosaics, and coloured them on the spot, and these tracings are from his rubbings.

Mosaic work may be divided into the following divisions:—I. For pavements. 1. Tesselated in which the design is formed of small cubes generally of marble, more rarely of glass and clay.

2. Of sectile work formed of large pieces of marble, shaped and cut so as to fit accurately one with another.

II. For walls and vaults, fictile and vermiculated (from vermes worm), *i.e.*, pieces of opaque glass in small cubes arranged so as to form pictures.

The opus Alexandrinum work is often partly sectile and partly tesselated.

Mr. Ruskin says in the Stones of Venice:—"There are two means of delight in all productions of art: Colour and form. The most vivid conditions of colour obtainable by human art are those of works in glass and enamel," and again, in speaking of the wall mosaics in S. Mark's, he calls the church "a vast illuminated missal, written within and without in letters of enamel and gold."

Professor Middleton, in his book on Rome, tells us that the Romans used glass mosaic and marble wall linings largely. I show here a diagram taken from an illustration in his book, showing the method pursued by the Romans in fixing marble linings to their walls. He says "Marble linings were usually fixed with great care, and were tied to the wall with long hook-like clamps, the ends of which were fixed with melted lead if the wall was of stone, or, if of brick, they were wedged into joints. These clamps were usually of iron, but in the more careful work bronze was used. The slabs were cut into thin pieces with saws and sand and water, emery being used for the harder stones. It is impossible to realise the amount of rich marbles which ancient Rome contained," and it should be remembered that it was not till the first century, B.C., that marble appears to have come into use there. "For more than three centuries marbles, alabasters, and porphyries in endless variety were being dug out in countless oriental quarries by whole armies of workmen, and were constantly being poured into Rome. Scarcely a church or a palace in Rome is without columns and wall linings, all taken from ancient buildings. The great christian basilicas, and especially the more magnificent chapels, such as those of the Corsini, Borghese, and Cibo families, owe their splendour entirely to these stolen marbles. Even the immense quantities which still exist give no notion whatever of what Rome once possessed. For by far the greater quantity perished in the limekilns of the early middle ages."

The Greek Byzantine artists were not so careful, I fancy, in the fixing of their marble linings as the Romans. In many churches the slabs are only secured with bent nails. I do not know how the beautifully neat-looking marble linings of the Sicilians and the Arabians

are secured to the wall. It may be that the simple beads the Arabian workmen in Sicily were so fond of using as part of the rich glass mosaic border which divided the slabs of marble have something to do in securing them.

I have here a drawing of a wall lining of a chapel in Saint Apollinare Nuovo in Ravenna. It shows that the artist has designed a beautifully-shaped vase; it may be that the piece of marble he had to deal with expressed this shape, and that he trimmed it and gave it life. I do not know that it has any direct significance. The circles represent half balls of rich marbles.

For really-finished workmanship, the Arabian work in Sicily of the eleventh, twelth, and thirteenth centuries and in Cairo are far superior to the Italian and Greek work. As a rule, the Cairene workmen used black and white, or dark green and white marble in long and slender widths, making beautiful patterns in this way; the Saracens working for the Norman Kings of Sicily contrived in the Cathedral of Monreale, La Martorana, and the Capella Palatina high dados of marbles, each slab divided from the other by a geometrical pattern of glass mosaic about 4 in. wide, with marble beads.

Surmounting the marble was arranged a frieze some 18 in. to 2 ft. deep of mosaic.

Glass mosaic was constantly used by the Romans for wall decorations in conjunction with marble wall linings, notably in the passage discovered on the Palatine, the house of the Vestals and the baths of Caracalla, but it was not till the Roman Emperors, Constantine and Justinian, so directly encouraged the arts of Byzantium by living themselves in the East and by building and decorating in the completest manner large churches and palaces, that the great art of glass mosaic working sprang into strong life.

In a very interesting paper on opaque glass, recently read before you by Mr. James Powell, a complete account was given of the making of glass or enamel mosaic, but I may be excused if I repeat a little of what he said. Glass mosaics are really coloured enamels or opaque glass of different colours. These enamels are formed of the same materials of which common glass is composed, but to these materials are added oxide of tin which gives the necessary opacity to the material and its extreme hardness; other metallic oxides are added and these give the glass its colour. All these materials have to be properly prepared and fused together and the degree of opaqueness and also the quality of colour depends partly upon the quantity and quality of the mineral elements in union with those of common glass, and are partly dependent upon the degree and continuance of heat to which the whole composition is subjected in the process of fusion.

If the enamels are not properly prepared they are not so lasting and become affected by the atmosphere.

Mr. Powell said that no doubt the paste was made in the same manner as obtains to this day in Murano. He said: "Crucibles are ranged much like washing basins in a lavatory, with the wood fire underneath; the glass, when sufficiently melted, is ladled out in small quantities on to a metal table, and pressed into circles averaging 8 in. diameter and about $\frac{3}{8}$ in. thick. These are then annealed, or gradually cooled in a kiln, and when cold are ready to be split and cracked up into tesseræ, which are afterwards subdivided again as the mosaicist requires."

It is certain that an almost countless number of beautiful colours can be obtained in this manufacture, purely from the addition of the metallic oxides in greater or less quantities. The Venice and Murano Glass Company told Mr. Powell they had made 37,000 colours and 400 golds.

The oxides used are copper, cobalt, chrome, gold, and manganese.

The gold and silver mosaic is, as has often been described, sandwiched between two thicknesses of glass. The gold leaf is fastened to a glass backing, and it is protected by a very thin sheet of glass on the face, the whole being united together by fusion. The backing is generally of an opaque red. If, instead of white glass for the front surface, you substitute coloured glass of pink, green, or yellow, you will get various effects of coloured gold or silver.

Besides these materials, mother-of-pearl and fine stone were used (especially in the mosaic of Justinian in S. Vitale, and King Roger in the Martorana).

I have here many photographs of Byzantine wall mosaics from Rome, Sicily, Ravenna, Constantinople, Venice, and Greece. I should detain you too long if I were to proceed now to describe them; some of them have been so often restored that they are much altered from what they once were. At the same time, they may be broadly distinguished. In the earlier examples at Ravenna and Rome, of the fifth to the tenth centuries, we notice a more statuesque or monumental treatment than obtains in the later works of the tenth to the thirteenth centuries, specimens of which we have in Venice, Monreale, and Palermo.

These Sicilian mosaics of the twelfth century, all, of course, by Greek craftsmen, show much vigour and life in the drawing and colouring of the Bible subjects from the Old and New Testament represented on the walls above the nave arcade,—subjects taken from the menalogium drawn up by the Emperor Porphyrogenitus in the tenth century, and similar to the mosaics over the nave arcade in the Church of the Nativity at Bethlehem. While these mosaics show much life and vigour, great dignity and breadth of treatment is obtained by the simple and direct way in which each subject is treated, while nothing can be more impressive than the colossal representation of the head of Christ in the apse over the altar, and the single figures of saints grouped round him.

The mosaics of the sixth century in St. Vitale, St. Apollinare Nuovo, and St. Apollinare in Classe, at Ravenna, are simpler, not only in the scheme of subjects represented, but also in the colours used, and the still broader and simpler effect gained by this very quiet treatment.

After Gaddo Gaddi, who in the thirteenth century made the great mosaic still existing on the façade of St. M. Maggiore, Rome, the genuine art of Italian glass mosaic may be said to have ended.

It is universally acknowledged that the mosaics of later date, from designs by Tintoret and Titian, to be seen in St. Mark's, are not interesting artistically or well done; and the uninteresting character of the Vatican mosaic work to be seen in St. Peter's is well known.

The Alexandria of past days has been called the home of mosaic; and the marble pavements called Opus Alexandrinum have been constantly described. Mr. Bolton has kindly lent me some specimens from Rome. I am sorry I have no drawing here of the Westminster example.

Another variety of Christian mosaic consisted in the insertion into grooves cut to the depth of about $\frac{1}{2}$ in., in white marble, of small cubes of coloured and gilded smalto (as the Italians call the material of which mosaic is composed), and in the arrangements of them in such geometrical combination as to make most elaborate patterns.

This decoration was chiefly used for church purposes, — for screens, pulpits, episcopal thrones, ciboria, and tabernacles. The earliest specimen is believed to be the chair and tribune in the Church of San Lorenzo at Rome, made probably about 580 A.D.

The shrine of Edward the Confessor is an English example of this kind of work, in that splendid period of English art in the reign of Henry III., 1270 A.D.

For further illustrations of mosaic and marble work, I must refer you to the works of Salzenburg on Santa Sophia, Constantinople; of Orgagna's St. Mark's, Venice; and Gravina's fine work on the Cathedral of Monreale.

Now that we have passed a little in review the works of the past, I should like to draw your attention to the position mosaic occupies amongst us now. It is thirty years ago and more since Sir M. Digby Wyatt read a paper,—I believe in this very room,—about the revival of mosaic working. Salviati and Sir Henry Layard also drew the attention, many years ago, of architects to the possible use of mosaic. Many of them have used it; Alfred Stevens has designed for it; and a mosaic has been executed in St. Paul's Cathedral.

In the South Kensington Museum are several panels of modern Venetian and English mosaic, the latter made by the tile-makers of Stoke-on-Trent, chiefly of clay, and differing altogether from the glass mosaic of Venice; and floor after floor of mosaic has been laid down in England. The best designed wall mosaic we see in the apse of the American Church at Rome, made from cartoons by Mr. Burne Jones. There seems, therefore, to to be a growing appreciation for this decoration. Nor need we be surprised that this is so, when we take the great qualities of mosaic into account.

The modern use of glass mosaic is, however, suffering, and suffering greatly, from many ills. The chief of these ailments is the terrible element of commercialism which has crept in so as to impede great works being performed in it. Mosaic artists in England and in Europe and America have at present no chance of making their art known or recognised as one of the greatest arts of decoration. No one yet has come forward to pay the price necessary for this. For it must be remembered that the art of mosaic decoration, as it existed in the early centuries of our era, was as noble as painting. Mosaic is like painting. The palette open to the use of the mosaicist is unlimited, the material permits him to design and work in a bold and noble manner; he can impart a dignity and solemnity to a composition which would equal, and in many cases be finer than, a painter could do.

Fresco-painting and glass-painting have been emancipated in England; every one knows these arts are not necessarily ground down by a commercial spirit. But at present it is with mosaic, as it is with stock brickwork, namely, How much per foot can it be turned out for? The lowest price is almost always sought for by the general public; and we may consider it marvellous that mosaic work is as able as we see it. I wish it were better; but it is our duty without doubt in the course of our work to help on this great art, and assist the craftsmen who are trying to help it from the mire.

Many things seem to be against this; at present, expense prevents mosaic being used in large masses. This is almost fatal. It may be said that a mosaic fitting of a reredos or font is quite ineffective, unless the background to each is a mass of skilfully arranged marble linings or columns. Until we are able to literally cover wall surfaces with mosaic, we can never hope to get a fine effect. Then again, in modern work, the tesseræ are often rubbed and ground down, until all the life is taken out of them, and a fine level, even surface obtained, and all with infinite trouble, the joints regular and neatly cemented. Nothing could be so contrary to the old wall mosaics, where each line, each tessera, indeed, seemed to express something; the tesseræ pressed into the cement, with the fractured part (generally speaking) of the enamel showing, and catching every glint of light, each tessera fairly close to each other, and no flushing up of joints, the result was a beautiful combination of colour, the open joints adding greatly to the sparkle and richness of the whole effect; there was no exact shaping of the tesseræ here, and no rubbing down. Each tessera was clipped quickly with a sharp instrument to the shape required, and promptly put in its place. The tesseræ were made to draw, in fact, and every tessera had a mission to perform.

But the general public prefer the glazy work at present. The mosaicist, unfortunately, cannot help this, though we may be sure they writhe under it often.

So that a livelihood can be made, the old system of fixing the mosaics in position has been departed from.

The old Byzantine method was to plaster with coarse plaster the walls, and then put a coat of finer white plaster over, the design was then traced on the wall, and the mosaicist clipped away the top coating of plaster as he went on, putting on new cement and fixing his tesseræ in it to the shape and sizes he required, beginning with the gold outlines first, and working up his background and filling in his figures. In this way he saw exactly what to do according to his own views, and we know his views were generally right ones; he had many colours, and he could so place his dark and light golds as he wished, and was perfectly acquainted with every detail of his work. The system which obtains now is entirely different—a level table top is covered with sheets of coarse brown-paper or thin cardboard, on this the design to be executed in mosaic is traced, *but reversed*. The tesseræ are stuck down with paste, face downwards on to the paper; and then the paper covered with the tesseræ is ready to be pressed into position on the wall cemented to receive it. Any little accidents, such as some tesseræ falling out of position, can be easily replaced afterwards; the whole is then too often washed over with liquid cement in front. It will thus be perceived that in this method the artist can only

see half of what he is doing. The design is in the first place reversed, though he could get used to that, like the wood engraver in his work, and secondly though he can see the colour of the tesseræ he is fixing on to the paper to a great extent, though the tesseræ are not always the same colour all through, he cannot see in the very least how his gold tesseræ are looking. He has no means of knowing this at all. It is, therefore, like painting part of a picture blindfolded, and the remainder in a state of uncertainty as to the final effect. The level table-top makes the mosaic, of course, perfectly level, though happily the twist of the hands in fixing the paper with the mosaic fixed upon it in positions imparts a little handiwork to it, and, therefore, a slight, though almost imperceptible variety.

It has been said that the old method of working in mosaic would take an unconscionable time; but I have never heard anyone propose to escape some of the technical peculiarities of fresco or oil painting, or of the proper jointing of masonry in what is called good work. I fancy the evil lies in the weak spirit of the general public who wish to get as much work of a kind done for as little money as possible. I know there are mosacists who would like to see their work better treated.

Mr. Henry Holiday has kindly lent me some photographs of a panel of a reredos representing the Last Supper, he executed chiefly with his own hands for a church in Philadelphia. This panel is 18 ft. long, and is, I suppose, 7 or 8 ft. high. He could not go and work in situ, and so he had an iron frame made, about 2 in. deep. The back was covered with iron wire, which formed a key for the plaster, which was presently put upon it; fine plaster was placed on this, the design was traced upon it, and each piece done as in the old mosaics. Of course, it took a little time to do, but the result justified the trouble, as, I think, even the photographs will prove to you. The mosaic was then sent to Philadelphia. (It was, I believe, for a few days in the Arts and Crafts Exhibition, where, perhaps, some of those present may have seen it.) It was then fixed, case and all, into the recess prepared for it.

I have to acknowledge with many thanks the kindness the Venice and Murano Glass Company and Messrs. Rust have shown in sending for exhibition some of their beautiful materials tonight.

The appreciation of mosaic in this country is gaining ground day by day, and we may even hope to see great and noble works in this material decorating our churches and public and even private buildings.

Mr. C. H. Brodie said he had much pleasure in moving a vote of thanks to Mr. Spence and Mr. Horsley for the interesting papers they had read. The subject was not one which was so well understood as it might be, or probably marble and mosaic would be more often used, and would be more successful when used. Of course, the great drawback to the use of these materials was their cost,—for that was a bugbear which had constantly to be faced in this commercially-spirited age. He was at a loss to know whence Mr. Horsley derived the idea that glass or enamel mosaics were ever rubbed down. Marble mosaics, whether on floors or walls, must be rubbed down, or the stain of the mortar or cement could not be removed; but if glass mosaics were subjected to the same treatment their brilliancy and colour would be very largely destroyed. Glass mosaics should always be fixed with the broken or fractured surfaces outwards. A great deal of modern mosaic and marble work was work to avoid, and yet, at the same time, such modern work was instructive from its failure. He quite agreed with Mr. Spence's remarks as to the necessity of mouldings in veined marbles being kept very flat, especially in richly-coloured marbles. Indeed, to work mouldings at all in such marbles was simply a waste of time and money. The only marble that could be carved with good effect was pure white statuary. Referring to the mosaics in the Guards' Chapel at Westminster, carried out under the direction of the late Mr. Street, R.A., the surrounding mouldings (which Mr. Street built in stone) had been removed and replaced by marble, and the result was not satisfactory. Another development of mosaic work which had not been referred to was the large series of mosaic pictures in Chester Cathedral, which had been executed from cartoons prepared by Messrs. Clayton & Bell under the direction of Sir Arthur Blomfield. These mosaics were entirely in marble. Then there was a fine series of mosaic pictures carried out by an artist named Shields, he thought, at Eaton Hall. Another noteworthy specimen of modern mosaic was contained in the Garfield Memorial at Cleveland, U.S.A. The cartoons for the mosaics in that work were drawn by Mr. Walter Lonsdale, and were very effective.

Mr. Arthur T. Bolton, in seconding the motion, said that as mention had been made of the book on mosaic pavements he was asking Mr. Batsford to publish, he should like to say a few words about it. There would be ten plates, three of the drawings being on the walls before them. It would be produced by photo-lithography, and the size would be 16 in. by 12 in. It would be bound only in a stiff paper cover, as it was intended for an office book, and the price was to be as low as possible, with the same object. It would be half a guinea, and it was necessary to find fifty subscribers as a guarantee. He appealed, therefore, to members to support the undertaking by taking copies. It was hoped, as the work would show the *technique* of old examples, being all rubbings of the old work at Pompeii and Venice, it would enable architects to control the execution of their pavements, which now were, he submitted, left too much to the Italian workmen in this country. The rubbings were furnished with key-plans, and also extra patterns from Palermo and Rome, all drawn to a uniform scale for the purpose of comparison. The speaker regretted the useless and chaotic manner in which Roman-British pavements had been published. It was very desirable to establish a standard method for such publications, if architects were to make any use of them. He then pointed out from the drawings exhibited some of the technical points of their execution and design. Alluding to the mosaic work of St. Paul's, he said he greatly regretted that so great an opportunity of forming a British school of mosaic-workers was being lost. It seemed absurd to bring over all the immense quantity of mosaic that would be required from Venice. He then spoke of the way in which the work was being done at Venice, and referred to the apse of the American Church at Rome by Mr. Burne Jones as a magnificent work, making one wish that the artist had designed the mosaics of St. Peter's,—which one speaker had alluded to. With regard to the Royal tombs in the Abbey, the artist came from Viterbo, and he had seen there some tombs by the same artist on the spot. They were aware of this fact, and were very proud of it. The municipal architect was restoring the tombs, and had kindly shown him the works.

Mr. J. C. Powell said he had been exceedingly interested in the two papers which had been read. He agreed that the practice of rubbing down glass mosaics was a most pernicious one. He thought that the great difficulty in the way of achieving success in modern mosaic work consisted in the practice of laying the tesseræ face downwards before they were fixed to the wall. But there were modifications of that process which, although more laborious and more costly, were capable of better results. He also agreed with what had been said as to the futility of attempting to do anything with mosaic in small patches, such as altar fronts or reredoses; even if they did not suffer from being too near the eye, they suffered by their isolation. No mosaic work should be placed less than 14 or 15 ft. from the floor,

Mr. W. J. N. Millard said that having visited Sicily, he had been fortunate enough to see some of the mosaics of Palermo, in some of which there was what appeared to be a beautiful blue background. He chanced to be able to get up to the level of some of these mosaics, and he was astonished to find that instead of the tesseræ forming that blue ground being of one uniform tint, the blue tesseræ were varied with tesseræ in a number of shades of blue grey. That was a practical lesson which might be of some use to those who were studying the subject.

Mr. F. R. Farrow said he thought they had learnt a great deal from the two papers which had been read to them. While he sympathised to some extent with what Mr. Spence had said as to the low tones of the fashionable so-called "art-tints," he thought it should be recollected that we were at present merely in a transition state from the state of whitewash, and there was no doubt that we should arrive at something better later on. Present efforts of decoration were, in fact, in his opinion, merely tentative. Mr. Spence had mentioned the use of bronze and marble in conjunction, as being sometimes successful; but if they wanted to see a case in which that conjunction had been eminently unsuccessful, let them look at the front of the Tivoli Music Hall in the Strand, where the caps were of bronze and the pilasters of marble. That instance was an admirable example of how not to do it. Even if bronze were used in conjunction with marble for internal work, it required exceeding care; but in this climate he thought that the conjunction was utterly unsuited for external work.

The Chairman, having said a few words, put the vote of thanks, which was carried by acclamation, and the readers of the papers briefly replied.*

Advanced Class of Construction and Practice.—At the meeting of this class on Wednesday last, Mr. Walter Burrows read a paper upon the subject of "Church Roofs." The paper was illustrated by a number of large chalk and other drawings. Messrs. Edward J. Tarver and Geo. Fleetwood attended as Visitors upon the occasion, and took part in the discussion, as also did Messrs. Goldsmith (Chairman), Beale, Clarke, Brodie, Hall, and Penfold.

THE LONDON COUNTY COUNCIL.

THE ordinary weekly meeting of the London County Council was held on Tuesday afternoon last at Spring-gardens, the Chairman, Sir John Lubbock, presiding.

The Blackwall Tunnel.—The adjourned Report of the Bridges Committee again came up for discussion. The recommendations of the Report were as follows:—

"(*a*) That the Committee be authorised to instruct the engineer to prepare drawings, specifications, and conditions of contract for a tunnel not more than 27 ft. external diameter, and not less than 23 ft. internal diameter, provision being made therein for vehicular and pedestrian traffic, and that tenders be invited by public advertisement for the construction of the works.

(*b*) That the Committee be authorised to empower the engineer, in preparing such drawings, specifications, and conditions of contract, to consult Sir B. Baker, K.C.M.G., and Mr. J. H. Greathead, M.I.C.E., as may be found desirable.

(*c*) That it is not desirable to proceed with the provisional works of sinking a shaft as authorised by the Council."

On the motion to adopt recommendation (*a*), Mr. Beachcroft now moved as an amendment,

"That after the word 'specification' in the first line the word 'estimates' be inserted, and that all the words after 'traffic' in the third line be omitted."

Mr. Westacott seconded the amendment, remarking that the Council ought to know what would be the probable cost of the undertaking before they proceeded to invite tenders.

Mr. Osborn (Chairman of the Bridges Committee) thought it would be most inadvisable to obtain estimates from the engineers if those estimates were to be published before tenders were invited.

In reply to Colonel Hughes, M.P., Mr. Hunter said that there would be ample room in the proposed tunnel for ordinary tramcars to pass one another.

The Chairman put the amendment to the vote in two sections, both of which were rejected by a considerable majority.

Mr. Saunders then moved a further amendment:—

"That the Committee be instructed to consider the comparative cost of (1) constructing lifts and necessary machinery and of inclined approaches, regard being had to the cost of property required in each case; (2) the annual expenditure of working and maintaining the lifts and of lighting and maintaining the approaches; and also to report whether a longer time would be required to make inclined approaches than to construct lifts, or *vice versa*."

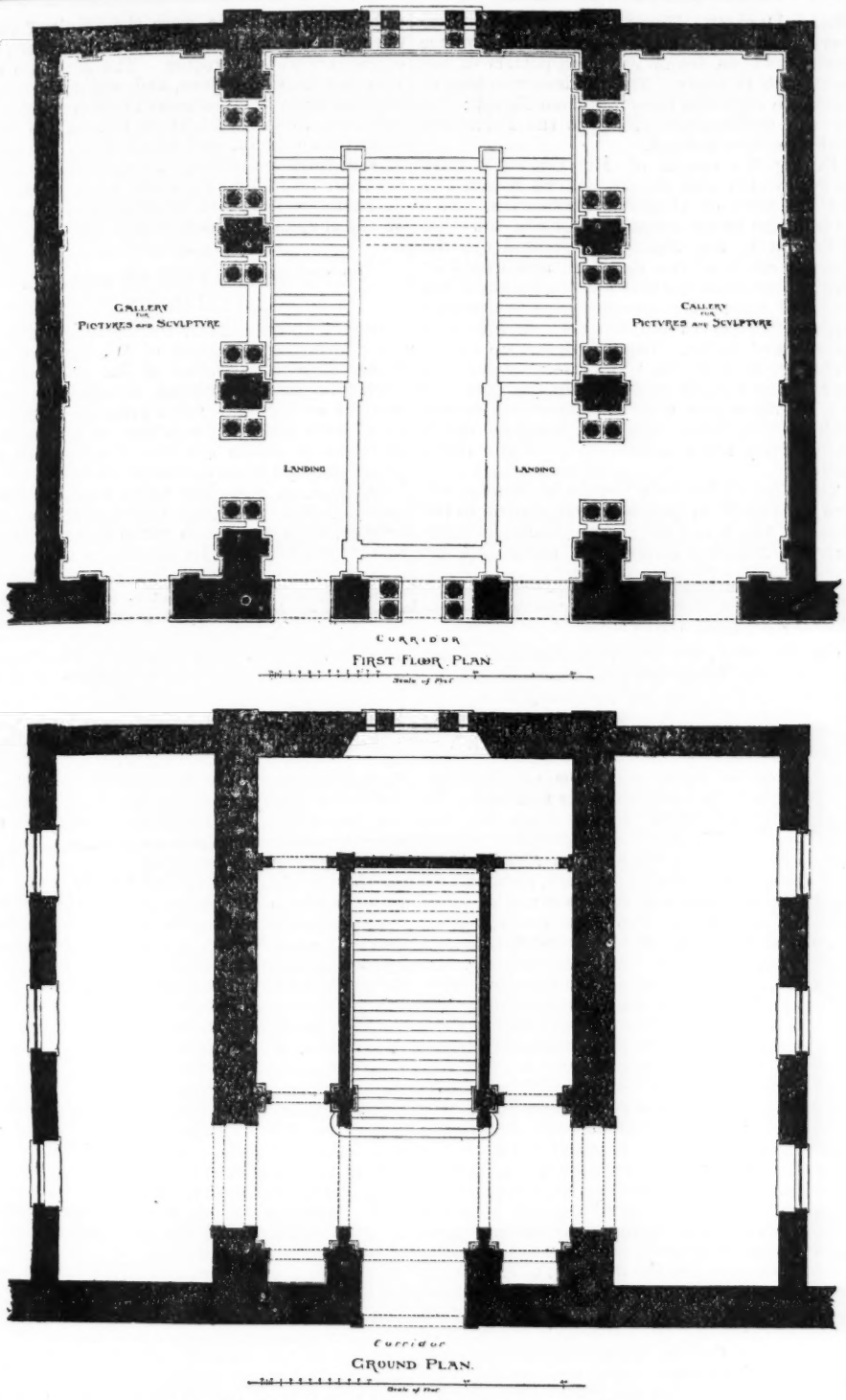
Mr. Osborn opposed the amendment, stating that lifts would be impracticable and unable to serve the traffic. Moreover, as they had only acquired an easement to tunnel under the land on the south bank of the river, they would require a new Act of Parliament to construct lifts there.

On a division, the amendment was defeated by 53 votes against 29.

Recommendation (*a*) was then agreed to, as were the two subsequent recommendations (*b*) and (*c*).

---

* In the course of the discussion, reference was made to the mosaic work in St. George's Church, Newcastle-on-Tyne, recently erected from the designs of Mr. Spence. In the *Builder* for November 15 last we gave two illustrations of the interior, showing the mosaics, which were executed by Messrs. Rust & Co. from the architect's designs.



Design for Staircase for a Town Mansion.—Plans.

Tribunal for Questions of Line of Frontage.—The first paragraph of the Building Act Committee's Report was as follows:—

"We have to report that letters have been received from the Royal Institute of British Architects, and the Surveyors' Institution, in reply to letters sent by our direction, notifying the appointment of the Vice-President of the Institute, Mr. Arthur Cates, and the President of the Surveyors' Institution, Mr. Robert Collier Driver, as their respective representatives on the tribunal constituted under the provisions of the London County Council (General Powers) Act, 1890, to hear the appeal made by the owner of certain buildings in Flower-mews, Archway-road, Islington, against the decision of the Superintending Architect with reference to the general line of buildings in that mews, under the provisions of the 28th section of that Act."

After transacting some further business, but leaving a great deal of important matter on the paper, the Council adjourned.

ROYAL VICTORIA HALL.—The following Science lectures will be given during March at the above hall:—March 3, Prof. Marshall Ward, on "A Piece of Wood; its Origin, Structure, and Uses." March 10, Mr. J. E. Flower, on "Spain." March 17, Mr. A. W. Clayden, on "Thunderstorms." March 24, Prof. Roger Smith, on "St. Paul's."

Illustrations.

BYZANTINE ORNAMENT.

THE plates given this week of Byzantine ornament are a portion of the illustrations to Professor Aitchison's fifth Royal Academy lecture, which will be found printed *in extenso* in another column. They include wall decoration from St. Sophia at Constantinople, exhibiting the quasi-Greek leafage forms peculiar to Byzantine work, and which seem to form a link between Classic and Gothic foliage; a capital from St. Sophia, showing the basket ornament and the commencement of the convex form which in other examples of Byzantine architecture is more decidedly developed; and a conventional peacock and acanthus ornament from St. Mark's, Venice. These are from diagrams specially made for the lectures. The other illustrations, showing a marble door and some marble ornament from the building called Μονὴ τῆς Χώρας at Constantinople, are from drawings by Mr. Sidney H. Barnsley.

HAMBLETON OLD HALL.

THIS plate is reduced from a plate in Mr. Gotch's new book, "The Architecture of the Renaissance in England." The subject of it is referred to in the article at the head of the present number.

DESIGN FOR A STAIRCASE FOR A TOWN MANSION.

WE gave last week the design for this subject which gained the Tite prize at the Institute of Architects this year, and we now give the design, by Mr. Thomas Davison, which, though it obtained no formal award, was highly spoken of by the Council, and generally regarded as the second best of those submitted.

The materials supposed to be used in it are marbles chiefly of the lighter-coloured varieties; the ceiling to be decorated in colour with allegorical subjects in large panels, the mouldings being kept subordinate.

THE PRE-GREEK SCHOOLS OF ART:

LECTURES AT THE ROYAL INSTITUTION.

MR. W. MARTIN CONWAY, F.S.A., in the course of a series of three lectures on the Pre-Greek Schools of Art, recently delivered at the Royal Institution, devoted some time and attention to "The Beginnings of Architecture." The lecturer began, by referring to the pre-historic period. Primeval man was a hunter, and so he represented on his weapons, &c., with a natural decorative instinct, the figures of animals, which intensely interested him. Animals not only interested him, but for some he had a peculiar respect and veneration. These were the totems, the sacred animals of his tribe or kindred. Sometimes they were kept as pets, sometimes an idol or image of them was set up. One of the earliest forms of temples consisted of the hutches for tame totems, or the shrines for their images.

The belief in the ancient world that the spirit or ghost of man continued, after death, doing the same things he had been accustomed to do during life, resulted in the custom of offerings to the dead, the so-called ancestor worship, and of making tombs exactly in the form of the house or cave in which he had lived. Thus the ordinary home of early man became one of the chief temple types. The early forms of general hospitality also influenced this. The normal abode consisted of two parts,—an outer, or public, and an inner, or private place. The outer was the guest-chamber; the inner, the family or private apartment. The outer temple chamber or court corresponded to the outer chamber of the house, and became the guest-chamber of the god: hence probably arose the right of sanctuary connected with temples. The chief fire burned on a hearth in the midst of the outer chamber of the house: Domestic worship was practised in early times, and this not without an obvious fitness became associated with the hearth. Thus the hearth came to be regarded in the house of the chief as the tribal altar, and so resulted in the temple the altar of the god. We find, therefore, the ancient temple planned like a house, with an altar in its outer hall or court, and a shrine in its private chamber, and all situated within a sacred enclosure.

Architecture took its rise from the cave-dwellers, and the earliest buildings were imitation caves. The first building materials were doubtless wood and earth; with the introduction of metal began the building with shaped stones, and afterwards, with better appliances and co-operation in labour power, developed the tendency to build on an increasingly large scale, and so we have the huge sepulchral chambers, the monoliths, &c.

In his second lecture Mr. Conway referred to the architecture of early Egypt. He showed how the earliest known form of Egyptian religion was founded on totemism, and that the early Egyptian race was a commingling of separate totem tribes or kindreds. He thought that the earliest Egyptian civilisation took its origin in influences imported from the East by way of the Indian Ocean and Red Sea into Upper Egypt.

There are indications of greater antiquity for the foundation of temples in the Theban neighbourhood than for those in Lower Egypt, and the tradition ascribing the foundation of the temple of Ptah at Memphis to a man from Upper Egypt is deserving of attention.

The earliest Egyptian architecture was of wood. No examples of this are left to us. The existence of a wood architecture in the time of the ancient empire does not admit of doubt; the paintings and sarcophagi show this, but as Egypt has always yielded little wood, it must have been an imported commodity. The building materials of the country were two—first mud, and from this sun-dried bricks second

excellent stone. The aborgines, doubtless, dwelt in wicker huts plastered with mud, as the fellaheen do to-day. A stone architecture developed from this; that the upper classes of the ancient empire dwelt in wooden structures shows their foreign extraction. The greater proportion of early wooden statues over stone also points to this.

Although foreign elements may lie at the basis of Egyptian forms and processes of art, the Egyptian idea arose, as it were, from the soil and resulted from a reaction of the physical circumstances of the surroundings of the inhabitants. There are no instances of great rock sculptures before the days of the new empire.

Excepting the wooden traditions of the wealthy, most of the early Egyptian buildings were of sun-dried bricks. Owing to the weakness and compressibility of the material, the walls of a mud-brick building must have been thicker at the foot, and naturally the outer surfaces would have slanted upwards. The angles, the weakest parts, were strengthened by a bundle of sticks, or a post of wood. The cheapest form of roofing would be of reeds covered with mud. The ends would stick out, and give the effect of a rough moulding forming a decorative finish to the walls.

All the necessary features of a mud-brick building were copied in the stone architecture of the country, and are its normal characteristic features. The attempt to imitate in one material forms proper to another is the foundation of advance in architecture and not an esthetic vice.

The plan of the normal Egyptian temple is very simple. Entering through the main gate in the great facade you pass through an open courtyard into a hall of columns. Beyond is the private chamber of the god. The inner portion is wholly dark and is surrounded on all sides by a passage giving entrance to a number of chambers all round. The holy of holies is thus an entirely separate chamber, dark, and surrounded by a dark passage. It lies under the same flat roof as the inner part of the temple, but its walls usually have an outside batter or slope, like external walls of mud-brick structures, and they are surmounted by the moulding called the Egyptian gorge. This indicates an edifice originally standing free in the open air in the midst of a sacred enclosure,—the old shrine of the totem folk, which, as a type, had become irrevocably fixed. These shrines are portrayed on early hieroglyphics exactly of this form, built of mud and plaited reeds, strengthened with wood posts at angles, and crowned above with a kind of fringe of the ends of the reeds, the original of the gorge moulding. A paling marks the limit of the sacred enclosure.

In the Middle Empire, Egyptian architecture reached its first period of greatness. No building of that period has, however, come down to us, and it is from the rock-cut tombs of Beni Hasan, Assiout, Assouan, &c., that we can form a sound judgment, and from relics unearthed by Mr. Flinders Petrie in the Fayum, from the ruins of a town occupied by the builders of a pyramid and temples of a king of the twelfth Dynasty, and which was deserted at the completion of the work. The objects here found must date from about 2500 B.C. Mr. Petrie found many small pillars, probably household altars, in the form of columns with bases and capitals. These show us that at this early period every known type of Egyptian column had already been invented.*

The Hyksos invasion did not end the great period of Egyptian architecture. The style was a product rather of Upper Egypt, and it was Lower Egypt that suffered most from the Hyksos. So when, in the eighteenth Dynasty, Upper Egypt again came to the front the style revived in all its splendour. The decline, however, soon set in, and, Mr. Conway said, all the works of Rameses the Great are frightful monstrosities, worst of all being the Ramesseum and the Great Hall of Columns at Karnak. The vice that destroyed the style was the desire for extravagant dimensions.

Under the twenty-sixth Dynasty all the arts revived; and later, in the reigns of the Ptolemies and the Roman Emperors, the last great school of Egyptian architecture flourished, and in it the ancient traditions of Egypt were still maintained, although Greek influence had crept in to some extent.

Architecture was, *par excellence*, the Egyptian art which influenced the Greeks. Mediterranean folks were in Egypt as early as the twelfth Dynasty. There were plenty of them there in the nineteenth, and in the Mycenæ tombs has been found Egyptian pottery of the eighteenth Dynasty. The fundamental idea of the Doric style was borrowed from Egypt; but for the architecture of Egypt the Parthenon could not have existed.

During the course of Mr. Conway's third lecture, which was on Chaldea, he referred to the antiquity of Chaldean civilisation, which he said was in an advanced state in the reign of Sargon I., B.C. 3800. He pointed out the common origin of the Egyptian and Chaldean civilisations from the bronze-using people of the south of Asia. He described the remarkable series of sculptures found by M. de Salzec in the ruins of Lagas. They were set up by the architect, King Gudea, to represent himself for ever in the Temple of Nin-girsu, his god. In one of them the king is represented seated, with drawing-board and cubit measure on his knee. They show minute study of the living model.

The plan of Sargon's temple at Khorsabad, being the same in general arrangement to the house of the kings at Tiryns, shows the similarity of the social structure of these different peoples.

* We hope in a later issue to give drawings of these interesting objects.

LECTURES AT UNIVERSITY COLLEGE.

On Thursday, the 19th inst., Professor Poole delivered the fourth* of his lectures on Greek Archæology, his special subject being the various local schools of Greek art. After recapitulating his former statements as to painting and sculpture in Greece, he pointed out the difference that exists between styles and schools. In architecture this distinction is plainly traceable; in succession we have many styles till the Renaissance. We see the Gothic, &c. But if one goes to Spain or Italy a good architectural book must be consulted; because, although we see the same succession, there do not seem to exist the same laws. Professor Poole showed how the architecture was necessarily different where the shadows fall horizontally or vertically. Strong cornices, for example, were to be found where the sun was strong, and more delicate where the reverse was the case. Even in Oriental (Arab) architecture we find the same laws and the same succession. In painting there were half-a-dozen distinct schools in Italy, and any man who was conversant with art could say of one, "This is Roman," and of another, "This is Sicilian." In England we have the same thing; we have, for example, the Norfolk school, and what we may even term the London school. The question may be asked, Why are people generally so ignorant as to the great schools of ancient art? The lecturer said that it might be owing to the difficulty of examining small coins. Painting did not influence sculpture in the round, but in the relief. We have that influence extending from 404-330. Turning to the school of Central Greece, he illustrated it by referring to several works, such as the eagle on the shield, in which the artist had succeeded admirably in placing the animal in the best position to display the splendid spring of the back and to show the beak in its best aspect. The second period,—that of painting,—seemed to have more emotion and less character than the first period, that of sculpture predominant. In Athenian art we have Hercules represented with wonderful grace, while in the Cretan representations, which were much more naturalistic, the whole idea seems to have been to exhibit his strength. In the Cretan representation of Europa we have the sacred bull biting its hide when it has been stung by a gadfly, while in the other school we have the "butting bull." The Athenian artist is much more repressed in his treatment of his subject than the Italian coin engraver who played with his theme much more freely. Greek artists never copied; they may have acted on a reminiscence, but there was never slavish copying; they always went to nature. This might be seen from the various representations of Nikè, the goddess of Victory; all like each other, but constantly varied. Prof. Poole said that if he took his students to Greece, they would find more than they could see; if they went to Italy or Sicily only coins were to be found. Sicily had an art peculiarly of her own. Like the Italian, it was small and more ornamental than the others. Its gem engraving was deeply interesting and effective. There were three coins of Syracuse which had very fine representations, and these were the result of great outbursts of artistic power at periods when the oppressors were overcome. The art there was very like that of Greece, and was marked by a peculiar *naïveté*. Professor Poole concluded by referring to what might be termed the semi-barbarous schools, and spoke of the possibility of still further dividing the schools of Greek art than he had done; while he impressed on his audience the great importance of the study of the subject on which he had dwelt.

* For brief reports of the previous lectures see pp. 70, 127, 149, *ante*.

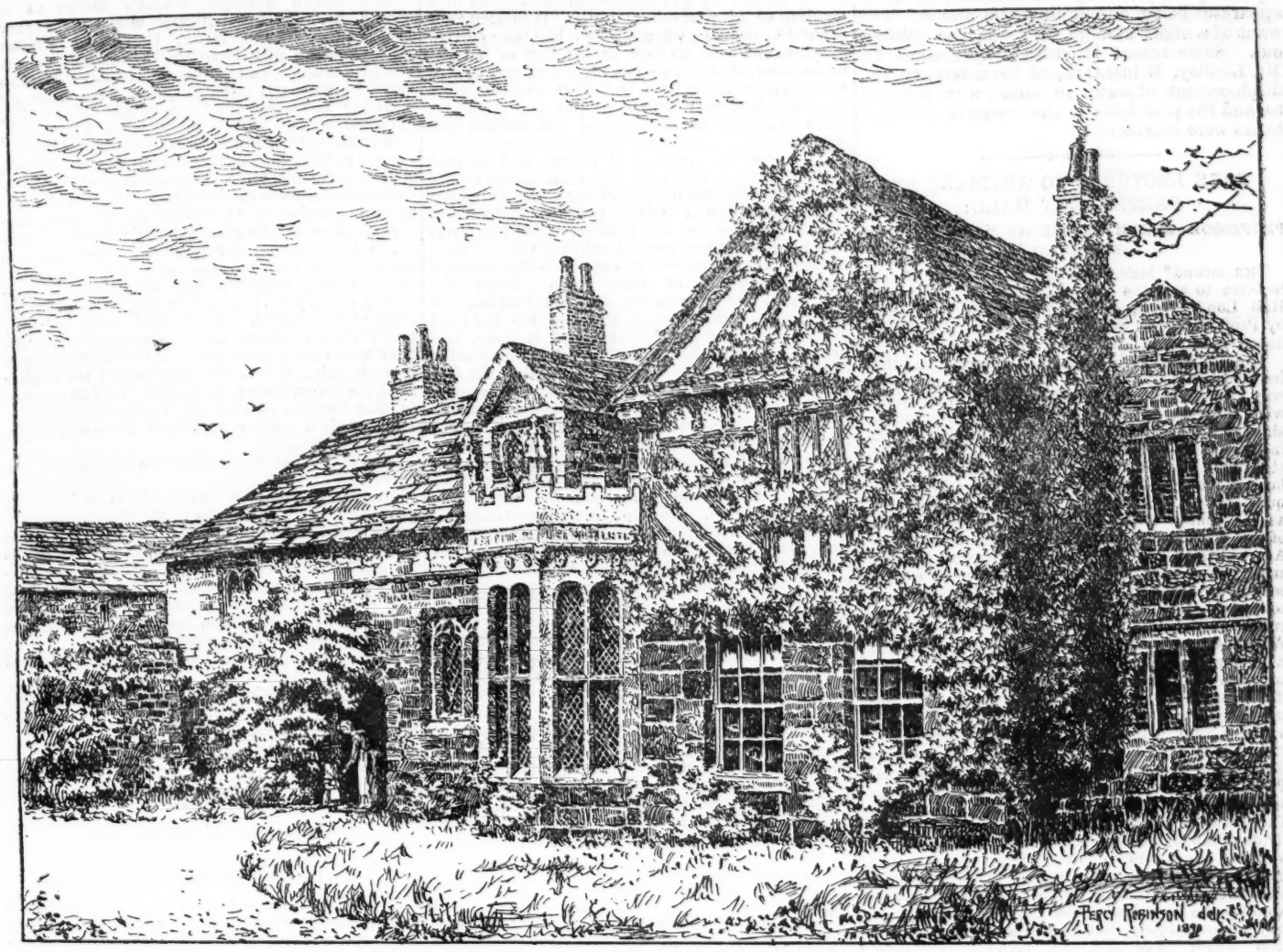
THE SANITATION OF SCHOOL-BUILDINGS.

On the 18th inst., Mr. W. P. Buchan delivered his address as President of the Sanitary and Social Economy Section of the Philosophical Society. Dr. M'Kendrick occupied the chair, and the subject was "The Progress of Sanitation," with particular reference to the condition of Glasgow public schools. Dealing with the progress made in sanitation since 1850,

Mr. Buchan said that while they had made great strides in many departments of this science, there was one in which they in Glasgow had lagged behind. He alluded to the ventilation of our buildings, whether these be houses, churches, halls, or schools. Scarcely any houses had a systematic means for ventilation provided, while the condition of many of our churches was not only disagreeable to the worshippers, but a disgrace to them. Having complained of the ventilation of the City Hall, Mr. Buchan proceeded to refer more particularly to the ventilation of our public schools. After visiting a number of the Glasgow schools, the conclusion that he had come to was that he could not understand how the Board allowed the ventilation to be carried out in so unscientific and unsatisfactory a manner. It would have been expected that, considering the costly character of the buildings and the uses for which they were erected, that such a vital feature as the ventilation would have been specially attended to, and that by an expert; but no evidence of such could be seen, even although the Board had often taken this matter out of the hands of the architects. The Chairman of the Board, at the opening of the last new school, in November last, had stated that they had had no experience in Glasgow of the shoddy work which was alleged to have been passed off on other Boards. After seventeen years, he (the Chairman) could say that not one of the schools erected had proved anything but satisfactory. Mr. Buchan said that, while their outward appearance was generally good, it was questionable if they could stand the same scrutiny that some of the London schools had recently undergone and come out scathless; for his own part, after personally examining a number of them,—including the newest,—they reminded him of "goodly apples rotten at the heart." A number of the country schools which had an improved an ample provision for ventilation had had that carried out at his suggestion. There were still others where the ventilation was a mere sham, and these ought not to get any Government grant till improved. He would not be surprised though the bad sanitary environments of the schools was one reason for the seeming increase of bad eyesight of a large proportion of the rising generation, and Glasgow schools must not be permitted to continue the nurseries for influenza, consumption, and other health and life-destroying influences. A country school of only one flat might be well ventilated automatically easily enough, but this was not the case with large three-flatted schools like many of those in Glasgow. He had the plans of the new large three-flatted school at Cubie-street sent him by the Glasgow School Board to see what scheme of ventilation he would recommend. He had advised mechanical power to be used, either wholly or partially; it would be seen by-and-bye whether or not the Board make a better job of the ventilation of this school than of the others.

Surveyorship, Builth. — Mr. Telfer Smith, architect and surveyor, Builth, was appointed Surveyor to the Builth-Wells Local Board at their last monthly meeting.

Remarkable Runic Stone.—On a farm, Opedal, in Ullensvang, Hardanger, Norway, a very remarkable Runic stone has just been discovered, the runes number thirty-four, and the inscription is about 1,600 years old. Professor Sophus Bugge, of Christiania, the well-known Runic interpreter, is engaged in deciphering the inscription.



Kiddle Hall, near Leeds.—Sketched by Mr. Percy Robinson.

KIDDLE HALL.

THIS interesting and picturesque specimen of old domestic work is situated on the Leeds and Tadcaster-road, about eight miles from Leeds. It was for many centuries the residence of the Ellis family, by whom it was probably built, but is now occupied by a farmer. The most interesting feature about the building is the peculiar shaped bay-window. This is of later date than the main building, being fifteenth-century work, as the following inscription which it bears, shows :—

"Orate pro bono statu Thom Elys
Et Anna uxoris
Sue qui ista fenestra fecerunt
Anno D.M. M.C.C.C.C., P.M."

Beneath this inscription is a cornice, enriched with various symbolic ornaments and devices, and having at each angle a grotesquely-carved gargoyle, and above is a battlemented parapet with pinnacles, enriched with a trailing pattern of vine-leaves and grapes.

There are also some interesting features in the interior, chiefly old oak work of the Georgian period. PERCY ROBINSON.

ARCHITECTURAL SOCIETIES.

BIRMINGHAM ARCHITECTURAL ASSOCIATION.—At the meeting of this Association on Tuesday last, Mr. T. Naden in the chair, Mr. A. T. Bolton, A.R.I.B.A., read a paper on "Italian Pavements and Mosaics." In the discussion which followed the paper, Mr. Naden said he wished to speak in the highest possible praise of the excellent drawings with which Mr. Bolton had illustrated his subject, and expressed the opinion that such descriptions as Mr. Bolton had given of the Italian pavements were the best of means for arousing interest in the subject, and for preventing the present-day commercial spirit from entirely overcoming the artistic efforts of artists.—Mr. Bidlake, who also spoke in praise of Mr. Bolton's drawings, said that in his opinion workmen often failed to produce an artistic effect from their placing too great importance on mechanical accuracy. —Mr. C. E. Bateman said that the enthusiasm and thoroughness with which Mr. Bolton had treated his subject were what was needed to arouse enthusiasm in others, and expressed the hope that Mr. Bolton would be persuaded to take up the subject of English mosaics in the same way that he had done the Italian.—Mr. Beck and Mr. Ward also spoke, and after a hearty vote of thanks had been unanimously passed to Mr. Bolton, the meeting closed.

GLASGOW ARCHITECTURAL ASSOCIATION.—On the 17th inst. Mr. G. S. Aitken delivered a lecture to the members of the Glasgow Architectural Association on "Architecture in Relation to Social Problems." Mr. W. J. Anderson occupied the chair. In treating this subject the chief points referred to by the lecturer were the opportunities for furthering the well-being of society that fall to the lot of the architect when he is called upon to carry out any scheme for the housing of either the industrial part of the population or the nomadic section. Turning to what might be esteemed some of the essentially practical parts of architectural work, reference was made to sanitation and to the fact that in the eagerness to make sure that all was sanitarily right, utter disregard was often shown to the architectural treatment of sanitary features. The smoke question was considered, and the idea propounded of the possibility of supplying heat in the future as water, gas, and electricity are at present. Pure water supply was another matter discussed, and the suggestion was made that it would be very much better if glazed earthenware cisterns were employed instead of lead and galvanised iron, if the difficulties of making them large and light enough, and providing for the due connexions were overcome. The means of disposing of coal ashes in tenemental houses were touched upon, the use of a properly-constructed dust-shoot was advocated, and the dust-bin system that obtains in the Glasgow model dwelling-houses was also alluded to. Other branches of architectural work that engage the attention of the professional man were considered, and, in conclusion, it was advanced that only by recognising architecture as a useful art could the success of its future be assured. Architecture pursued merely for its own sake was doomed to failure.

ENGINEERING SOCIETIES.

LIVERPOOL ENGINEERING SOCIETY.—The seventh ordinary meeting of this society for the present session was held at the Royal Institution, Colquitt-street, on Wednesday evening, February 18, Mr. James Morgan, Vice-President, in the chair. A paper, entitled "Foundations," was read by Mr. H. G. F. Barham. The author in his paper first dealt with trial borings for foundations generally, and then passed on to a description of foundations on rock and firm ground, including the excavation of sumps, timbering, and the preparation of rock surfaces. The paper then dealt with the various methods of forming foundations on soft ground. A description followed of foundations laid under water, first, by excluding the water by means of dams and coffer-dams, and, secondly, without excluding water, by the use of various forms of concrete. The paper terminated with a consideration of pile foundations, pier sinking, and pneumatic foundations.—A discussion followed, in which various parts of the paper were commented upon, and a vote of thanks to Mr. Barham terminated the proceedings.

THE JUNIOR ENGINEERING SOCIETY.—A meeting of this society was held at the Westminster Palace Hotel on the 20th inst., when papers were read by Mr. J. B. Ball, Stud. Inst. C.E., and Mr. Albert Wollheim, Stud. Inst. C.E., on "Carriage Way Pavements in Large Cities," and on "The Design and Construction of Sewage Precipitation Works." There was a large attendance of members and visitors, and animated discussions ensued. Mr. Ball briefly described the essential features of a good carriage-way pavement, pointing out the absolute necessity of a proper foundation. The transverse section and gradients were dealt with, and the author advocated the use of subways for sewers, gas and water-pipes, electric wires, &c., and referred to the importance of frequent cleansing of the streets. Mr. Wollheim, in his paper, drew attention to the salient points which should govern the design of sewage precipitation works, and proceeded to describe pumping machinery and various apparatuses for adding the chemicals,

especially emphasising the necessity of each apparatus being automatic in its action. The want of a night storage tank was also pointed out. Some recent important experiments by Mr. Lindley, M.Inst.C.E., of Frankfort, on the displacement of water in tanks, were referred to, and the principles of the design of settling-tanks were considered.

FREE LECTURES TO ARTISANS AT CARPENTERS' HALL:

PROFESSOR ROGER SMITH ON "FAILURES IN BUILDING."

THE second* lecture of this year's series of free lectures to artisans was delivered at Carpenters' Hall, London-wall, on Wednesday, the 18th inst., by Prof. T. Roger Smith, F.R.I.B.A, Mr. Waterhouse, R.A., P.R.I.B.A., was in the chair.

The lecturer, in his opening remarks, said that he used the word "failure" to imply some giving way of a structure. In citing examples of failure with the view of deducing lessons therefrom, he should, for obvious reasons, refrain from mentioning instances of failure which might affect persons still living; but omitting all such cases there was a large field open to observation. Nearly if not quite forty years ago, he had the opportunity, as a young student, of visiting the scene of a disastrous calamity. At the Bricklayers' Arms Station of the South-Eastern Railway an extensive yard had been covered in by roofing carried on a multitude of columns, and the roof had collapsed. Some accident (he believed it was an engine getting off the line) threw down one column. With that column fell down the bay of roofing that it supported; that brought down the next column, and that the next bay, and so on until the whole structure came down like a house of cards. For engineers and railway managers the failure was a warning that many intermediate supports to a station roof were a source of danger, and they were therefore afterwards avoided as much as possible. There was, however, another circumstance connected with the failure which was very instructive. There was a latent defect in the framing. The struts of the trusses, which were simple iron trusses, were too short, and in putting them together, the trusses were so tightened-up as to be weakened instead of strengthened by the framing. This fact would serve to explain why the whole roof gave way so completely, but it was a feature of the case which was not, he believed, generally known at the time. This great failure occurred at a time when the South-Eastern Railway was about to reconstruct its terminus at London Bridge, and before our present experience of iron roofs of large span had been gained. It was determined to roof the new station at London Bridge with a roof covering the entire series of platforms in one span, so as to avoid all columns, and it was also determined to construct the roof of fir timber. That roof, too, was a failure. True, it was standing at the present moment, but every truss was now supported by a timber post near the centre of the span, showing that the framing had sagged. The lecturer then went on to consider the cause of the failure of the trusses of this roof, which was of the queen-post type, with a span between supports of 92 ft. He attributed the failure of the roof to the comparative lightness of the scantlings of the timbers used, to the flatness of the pitch, to the placing of the trusses rather too far apart, and to the softness and comparative flexibility of fir timber. Having referred to the failure of the Great Northern Railway Terminus roof at King's Cross, whose main supports consisted of semi-circular ribs, each built up of laminated timbers, but which have of late years been replaced by wrought-iron ribs, as described in the *Builder* at the time, Professor Roger Smith referred to the roof of the old hall at Eltham Palace. This roof had a span of only 36 ft. as compared with the 68 ft. span of the Westminster Hall roof. It was heavily timbered and framed in oak, yet it had spread and thrust out the walls,—partly owing to its flat pitch, but chiefly owing to the foot of the principal rafter coming down on to the hammer-beam inside the line of the wall instead of well back from that line. There was thus little to prevent the free end of the hammer-beam from dropping, and so dislocating the whole framework. If one compared the foot of the rafter at Eltham with the same part of the Westminster Hall truss,—bearing in mind that the hammer-beam was a lever, that the fulcrum was the top of the wall-post, and that the weight of the principal rafter on the short end of the lever was what ought to keep the long end from dropping,—one would see how inferior was the skill of the carpenter who designed the Eltham roof to that of the earlier designer of the Westminster Hall roof. The lecturer next proceeded to enumerate some of the many failures which were constantly occuring in buildings owing to injudicious alterations or to inherent defects in the carpentry,—defects which were sure to be intensified by ignorant tampering with the work. A very common cause of failure in buildings was the making of alterations which increased the load to be carried by the foundations and walls of a building or of part of a building. It seemed very natural to suppose, when a weight had been carried steadily, and with no sign of bending or bulging or cracking, that there was a reserve of strength in the structure and in its foundations, and that more weight might very safely be put on. It might often be so, but it often turned out that the idea was mistaken,—that the addition of a new load disturbed what was quite quiet before, and induced signs of failure, either in the foundations or the structure. Alluding to the accident which happened at King's College in 1869, in that part of Somerset House occupied by the College, under the river-terrace, the lecturer pointed out that that accident illustrated the danger of the use of badly-designed cast-iron girders, of tying such girders into the walls, and of sapping the foundations. In this case, the construction either of the low level main sewer, or of the Underground Railway, had probably affected the foundations by the abstraction of water by pumping. In this connexion the lecturer said it was possible for causes much less apparently formidable than continuous pumping or the cutting of a deep sewer to produce the most serious results on the stability of buildings, and especially on clay soil on a hill-side. He mentioned two cases of this kind which had come under his notice,—one from letting water in, and the other from drawing water off. Now and then failures occurred in buildings owing to fraudulent or negligent construction. Without saying anything as to failures due to fraudulent construction, it was unfortunately the fact that carelessness and stupidity were sometimes almost as formidable in their consequences as positive fraud. So many persons were careless, and so many deficient in common sense, that he would strongly impress upon all who had to superintend buildings the necessity of minute supervision and unceasing vigilance.

* For brief report of first lecture, see p. 151, *ante*.

The third lecture of the series was delivered on Wednesday evening last by Prof. Marshall Ward, M.A., F.R.S., who chose as his subject, "Timber, its Growth and Decay," with lantern illustrations. Sir J. C. Lawrence, Bart., presided, and there was again a good attendance.

BUILDERS' CLERKS' BENEVOLENT INSTITUTION.

THE twenty-fourth annual general meeting of the donors and subscribers of this Institution took place on Tuesday evening last at the offices, 21, New Bridge-street, E.C., the President-elect, Mr. Benjamin Hannen, jun. (Messrs. Cubitt & Co.), in the chair, supported by Messrs. Thos. F. Rider and Wm. Robert Freeman, (Vice-Presidents), and by Messrs. E. Brooks (Treasurer), C. K. Turpin, E. B. Gammon, A. Stansfeld, G. C. Harrison, H. W. Parker, A. A. Stanger, and other gentlemen. Mr. H. H. Bartlett, the retiring President, was present part of the evening, but had to leave early in order to fulfil another engagement. Letters were read from Mr. E. C. Roe, B. C. Fox, and others, who could not attend. Mr. John Howard Colls also conveyed his regrets at not being able to be present.

The Secretary read the report, which stated that the income for the past year amounted to a total of 672*l.* 11s. 9d., and consisted of 294*l.* 9s. 6d. in subscriptions, 277*l.* 2s. in donations, and 101*l.* 0s. 3d. in dividends. The expenditure was 489*l.* 12s. 3d., including 385*l.* payments to pensioners. The number of pensioners on the books was nineteen, but one of the number having resigned owing to improved circumstances, there was a present total of eighteen, thus leaving a vacancy on the pension list. With regard to the Orphan Fund, as one of the children had completed her school term, there was a vacancy for another child. The annual dinner took place at the Holborn Restaurant on March 31, 1890, at which Mr. H. H. Bartlett presided. As the result of his appeal on that occasion, donations, &c., to the amount of 310*l.* were announced. Large numbers of clerks again attended, many of those who had not before assisted subscribing to the funds on the occasion. The amount of funds invested stands at 3,650*l.* (1,700*l.* being to the credit of the Relief Fund and 1,950*l.* to the Orphan Fund). The Committee thank Mr. H. H. Bartlett for his services as president during the past year, and announced that Mr. B. Hannen, jun., had kindly consented to become his successor. The Committee also thank the builders, architects, and merchants for their steady support, and express a hope for the continuance of the same.

The balance-sheets were then read by Mr. E. Brooks (the Treasurer).

The President-elect, in moving the adoption of the report, said that when he was first spoken to as to becoming President, he had some diffidence in meeting the Committee's wishes, but as he felt that it would be an honour to follow the long list of gentlemen who had occupied that position before him, and as he felt he should have the cordial support of the Committee, he had accepted the invitation. He believed the Institution had done, and was doing, a noble work; still, he thought there would have been more applications, and the fact of there not being more seemed to admit of one of two explanations,—either the Institution was not as widely known amongst builders' clerks as it should be, or else builders' clerks were very rich; but, if the latter, it seemed difficult to understand why more clerks did not support the Institution than at present. In Mr. Freeman's year, he believed, some proposals were made for reducing the amount of the annual subscription. To some clerks a guinea might seem a large sum, and he thought if the scale of subscriptions was arranged so that 5s. would give one vote, while for a guinea five votes could be given, it would be an inducement for more clerks to join. He also thought if each member could canvass the clerks the subscriptions would be greatly increased,—sufficiently so, in fact, to pay the pensions. Last year the subscriptions were not sufficient for this alone, the amount being made up from donations, and supposing a bad year, it might be needful to withdraw some of the capital. He thought, as he had said, that if the Committee could go amongst the clerks they would get a large sum. If the Institution had a weak point, it was the smallness of the number of clerks subscribing; he trusted to see an advance in that respect, so that the Institution might be able to help a greater number of those who might need its assistance.

Mr. T. F. Rider seconded the adoption of the report.

Mr. W. R. Freeman (Messrs. Mowlem & Co.), in proposing a vote of thanks to Mr. Bartlett and the other retiring officers, spoke of Mr. Bartlett as being a very able man and well able to carry out, as he was sure he had done, the duties of the Presidency. The Committee also had done their work ably and carefully, and he well remembered during his own year of office with how much thoroughness the work had always been gone through.

The resolution was seconded by Mr. Brooks and carried unanimously.

Officers for the ensuing year were then elected, and the meeting closed with a cordial vote of thanks to the Chairman.

Correspondence.

To the Editor of THE BUILDER.

SOUTHAMPTON BATHS TENDERS.

SIR,—In reference to the list of tenders in the current issue for baths, &c., for the Corporation at Southampton, we beg to state that no specification or bills of quantities were furnished, but that each contractor was allowed to use his own judgment as to what was the best scheme, consequently there can be no comparison between the tenders. It is certainly remarkable to find an estimate for 1,467*l.* and one for 648*l.* under the same list of tenders. In tenders for the boilers for this work it was quite possible to make a difference of 150*l.* if the boilers were made of iron instead of steel, and in this estimate we included for best steel boilers, as, being for a Corporation job, we took for the best materials and system that we are acquainted with, and evidently some of our competitors have done likewise. It is rather a large order to gauge the Corporation's views of what they are prepared to spend in a case of this kind.

JOHN SMEATON, SON, & Co.

CONCERT HALL, LANGHAM-PLACE.

SIR,—I am very sorry my friend Mr. Phipps has thought it necessary to write to the *Builder* on the subject of his connexion with the above, since he has settled with me, received a sum of money, and relinquished all claim. I cannot, however, allow the matter to be passed by.

The following is the history. Some years back I had designed residential flats to be erected on the site, and, when all was in readiness, the Concert Hall Company offered terms which were agreed to, I going with the land. Mr. Phipps was appointed by the Company, as it was said he could introduce directors and share capital. An appeal was made for funds, but not satisfactorily responded to. It was then determined to proceed privately.

Mr. Phipps prepared the plans and negotiated with the late Metropolitan Board of Works only, nothing more; the skeleton sections were supplied by Messrs. Moreland, with whom Mr. Phipps had made arrangements for the iron and steel work. was asked how many the hall would hold, and finding the number unsatisfactory, on February 2, 1888, I communicated my ideas for a re-cast of plan to Mr. Phipps; on the 4th, asked him to a conference on the subject, and again on May 3, with the result that the sittings were increased by 700. I regret being compelled to write this, but the idea of a dry nurse is not palatable.

For the architecture inside and outside, accoustic arrangements, external loggias, and construction I am alone responsible.

T. E. KNIGHTLEY.

ENGLISH OPERA HOUSE.—The makers of the constructional ironwork in this theatre write to say that their names should have been given as "Reade & Reilly," not "Neade & Riley." The mistake (as they are aware) was not ours.

The Student's Column.

VENTILATION AND WARMING.—VIII.

FORMULÆ FOR MOVING AIR.

WE will now investigate the universal formula for movement of fluids in general, which we shall find useful in its application to the movement of air in particular.

We will consider the most general case, namely, a system of piping of varying temperature and section, through which a quantity of water of M cubic feet, at a normal or standard temperature, has to pass. Let the mean temperature of the column of warm water be T°, and that of the column of cool water of same height, t°. For any particular section S of the system we have MA as the quantity, where A denotes the co-efficient of expansion due to the temperature θ of the water at the section S. The velocity is $\frac{MA}{S}$ and the column of velocity or vertical height through which the liquid must fall to produce that velocity is $\frac{M^2 A^2}{2g S^2}$ at a temperature θ. This is equal to $\frac{M^2 A^2}{2g S^2} \cdot \frac{1}{A} = \frac{M^2 A}{2g S^2}$ at the standard temperature, or $\frac{M^2 A}{2g S^2} \cdot A_T$ at the temperature T°.

We have, therefore, generally, for any particular section of the system, the column of velocity for a corresponding temperature T,

(15) $\frac{M^2}{2g} A_T \times \frac{A}{S^2}$

and the loss of power for friction in height of column

(16) $\frac{M^2}{2g} A_T \times \frac{CA}{S^2}$, where C is the co-efficient of loss.

The left-hand factor of these expressions is constant, while the other varies with each particular section. The theoretical necessary pressure is evidently one for which the expression (15) will be a maximum. We may, therefore, write this—

(17)... $\frac{M^2}{2g} A_T \times max. \frac{A}{S^2}$

The column of warm water has a height H, and a mean temperature T. To raise this, there is required not only a column of the same height and temperature, but also a further weight which is sufficient to overcome the resistances of friction. These amount from (16) to

(18)... $\frac{M^2}{2g} A_T \times \Sigma_1 \frac{CA}{S^2}$, where Σ_1 is the sum of the resistances in the various sections of the warm-water column.

This amount (18) is thus sufficient to support the weight of the warm column and to meet its frictional resistance. There may also be a fixed resistance to be overcome, which we may represent by a column of water at the standard temperature and of a height of h_1. This with a mean temperature will be changed to $h_1 A_T$, and we obtain for the sum of resistances

$$\frac{M^2}{2g} A_T \Sigma_1 \frac{CA}{S^2} + h_1 A_T$$

Therefore, altogether we have to overcome

$$H + \frac{M^2}{2g} A_T \Sigma_1 \frac{CA}{S^2} + h_1 A_T$$

Adding to this the column of velocity from (17) we have a requirement of

(19) ... $H + \frac{M^2}{2g} A_T \Sigma_1 \frac{CA}{S^2} + h_1 A_T + \frac{M^2}{2g} A_T \times max \frac{A}{S^2}$

The cold column of height H and temperature t reduced to standard temperature is HA'_t, and for the mean temperature is raised to $HA'_t A_T$.

For this we must bring into our calculation, as before, a varying and a fixed resistance, and we obtain, therefore, for the resulting pressure:—

$$H A'_t A_T - \frac{M^2}{2g} A_T \Sigma_2 \frac{CA}{S^2} - h_2 A_T$$

Equating this with (19) we have:—

$$HA'_t A_T - H - h_2 A_T - h_1 A_T = \frac{M^2}{2g} A_T \Sigma_2 \frac{CA}{S^2} + \frac{M^2}{2g} A_T \Sigma_1 \frac{CA}{S^2} + \frac{M^2}{2g} A_T \times max. \frac{A}{S^2}$$

$$\text{or } H \left(A'_t - \frac{1}{A_T}\right) A_T - (h_1 + h_2) A_T = \frac{M^2}{2g} A_T \left(\Sigma_1 \frac{CA}{S^2} + \Sigma_2 \frac{CA}{S^2} + max. \frac{A}{S^2}\right)$$

If we take h as the sum of h_1 and h_2 and Σ as that of Σ_1 and Σ_2 we obtain

$$H (A'_t - A'_T) - h = \frac{M^2}{2g} \left(\Sigma \frac{CA}{S^2} + max. \frac{A}{S^2}\right)$$

from which results

$$(20)\ M = \sqrt{\frac{2g [H (A'_t - A'_T) - h]}{max. \frac{A}{S^2} + \Sigma \frac{CA}{S^2}}}$$

as the universal formula for the movement of fluids, which we shall find to be of considerable utility in regard to the movement of air.

From this general formula we may deduce a simpler expression known as Wölpert's formula.

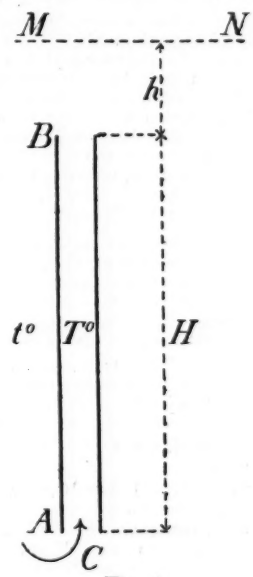


Fig. 4.

In fig. 4 we will suppose AB an open flue. The external atmosphere presses equally in all directions upon it, including, therefore, the direction of the arrow C. The column of warm air, whether produced by a fire at C, or by other means of maintaining a circulation of hot air in the flue, will rise above B, and at last become cooled in the region of MN. We have, therefore, an internal column of warm air of the height H, and above it one of diminishing temperature of the height h, and both together weighing on A; while the external column of cold air of the height (H + h) acts as a lifting power at the point A. Above MN the general atmospheric pressure acts equally upon both the columns, so that it does not influence the working. The extent of h is very variable, and may become nil if a wind current blows sideways across the mouth of the flue; therefore, in our calculation, we must reckon the value of h as nil.

The general formula (20) holding good for air, we shall have, taking H_o and h_o for a normal temperature at freezing-point,—

$$M_0 = \sqrt{\frac{2g [H_0 (A'_t - A'_T) - h_0]}{max. \frac{A}{S^2} + \Sigma C \frac{A}{S^2}}}$$

If we now take for the sake of simplicity, T and t to denote the mean temperature of the warm and cold air columns respectively, the magnitude of A in $max. \frac{A}{S^2}$ can only have the value of A_T or A_t. If the column of warm air has a free exit and upward course, the imaginary column of cold air has, so to speak, an endless section, and then $\frac{A_t}{S^2} = 0$. Therefore in this case the $max. \frac{A}{S^2}$ can be obtained from the column of warm air. If, on the other hand, the stream of cold air is passing downwards into the warmer by reason of the end B being much cooled, we must similarly obtain the $max. \frac{A}{S^2}$ from the cold air column; therefore this expression becomes $max. \frac{A_t}{S^2}$ If we now further denote by S the smallest section, and take no account of any greater than S, then with $h_o = 0$ as above explained, our formula becomes in the first case, $M_0 = \sqrt{\frac{2g H (A'_t - A'_T)}{\frac{A_T}{S^2} (1 + \Sigma C)}}$ and $v = \frac{M_0 A_T}{S}$; and in the second case

$$M_0 = \sqrt{\frac{2g H (A'_t - A'_T)}{\frac{A_t}{S^2} (1 + \Sigma C)}} \text{ and } v = \frac{M_0 A_t}{S}$$

Reducing these expressions we have

$$M_0 = S \sqrt{\frac{1}{1 + \Sigma C}} \sqrt{\frac{2g H (A'_t - A'_T)}{A_T}}$$

$$\text{and } v = \frac{M_0 A_T}{S}$$

$$M_0 = S \sqrt{\frac{1}{1 + \Sigma C}} \sqrt{\frac{2g H (A'_t - A'_T)}{A_t}}$$

$$\text{and } v = \frac{M_0 A_t}{S}$$

If we now substitute the values of M_0 in the equations for v we have

$$v = \sqrt{\frac{1}{1 + \Sigma C}} \sqrt{2g H (A'_t - A'_T) A_T} \text{ and}$$

$$v = \sqrt{\frac{1}{1 + \Sigma C}} \sqrt{2g H (A'_t - A'_T) A_t}$$

If we now substitute the corresponding values in terms of a, the co-efficient of expansion for each degree of temperature, for A'_t, A'_T, A_t and A_T we obtain

$$(21)\ v = \sqrt{\frac{1}{1 + \Sigma C}} \times \sqrt{2g H \left(\frac{1}{1 + at} - \frac{1}{1 + aT}\right) (1 + aT)}$$

$$\text{and } v = \sqrt{\frac{1}{1 + \Sigma C}} \times \sqrt{2g H \left(\frac{1}{1 + at} - \frac{1}{1 + aT}\right) (1 + at)}$$

Reducing this we get

$$v = \sqrt{\frac{1}{1 + \Sigma C}} \sqrt{2g H \frac{a (T - t)}{1 + at}} \text{ and}$$

$$v = \sqrt{\frac{1}{1 + \Sigma C}} \sqrt{2g H \frac{a (T - t)}{1 + aT}}$$

Dividing numerator and denominator of the last fraction by a, and remembering that $\frac{1}{a} = \frac{1}{491}$ if we reckon the temperature in degrees Fahrenheit, and $\frac{1}{273}$ if in degrees Centigrade, we have

$$(22)\ \begin{cases} v = \sqrt{\frac{1}{1 + \Sigma C}} \sqrt{\frac{2g H (T - t)}{491 + t}} \text{ and} \\ v = \sqrt{\frac{1}{1 + \Sigma C}} \sqrt{\frac{2g H (T - t)}{491 + T}} \end{cases}$$

If for $\sqrt{\frac{1}{1 + \Sigma C}}$ the factor of frictional obstruction, we write C, the value of which in straight flues is usually 0·5 to 0·3, we obtain the expressions $v = C \sqrt{\frac{2g H (T - t)}{273 + t}}$ and $v = C \sqrt{\frac{2g H (T - t)}{273 + T}}$ In this form the expression for the velocity of moving air is known by the name of Wölpert's formula.

THE NEW YORK WATER SUPPLY.—Ever since the time when the Croton Aqueduct, which supplies New York with water, was first opened, the great dam, known as the Quaker Bridge Dam, and which was to form a complementary work, has engaged the attention of engineers and the New York public generally. That dam, which was to be about four miles below the present Croton Dam, was to give a total storage capacity of 34,000,000,000 gallons. Its height was to be 180 ft. above the bed of the Croton river, below which the foundations would go down 91 ft., and it was not considered perfectly safe on that account. Partly for this reason, and its cost (4,087,000 dols.), it found many opponents. The New York Aqueduct Commissioners have now decided upon the construction of a dam designed to be somewhat less expensive, and at a site presenting fewer engineering difficulties, at Cornell. The site selected for the Cornell Dam is about 1¼ miles above that which had been selected for the Quaker Bridge Dam, and 2¾ miles below the present Croton Dam. It will give an additional drainage area of 21 square miles, and a storage capacity of 30,000,000 gallons. The new dam will rise 159 ft. above the bed of the Croton river, the foundations going down 70 ft. Its length between flow lines will be 1,736 ft., and its cost is estimated at 3,650,000 dols. Mr. Heley has been instructed to prepare plans without delay, and he estimates that it will take five years to build the new dam.

GENERAL BUILDING NEWS.

PROPOSED RESIDENCE FOR THE BISHOP OF WAKEFIELD.—The General Works Committee of the Wakefield Corporation have just approved of plans for the proposed residence for the Bishop of Wakefield, which have been prepared by Mr. William White, architect, of London. The building will stand on a plot of land three acres in extent, situate on the north side of Westfield-road. It is to be of red brick with stone dressings, standing back from the road, and having south and east aspects. There are forty-five rooms in all, with their attendant bath-rooms, store-rooms, pantries, and offices. A small conservatory is placed at the south-west corner, and while the main portion of the residence is three stories, that part over the entrance rises to four stories, and forms a tower. The sanitary arrangements and fittings will, it is said, be on the most improved modern principles. Stable buildings will be erected behind the house on the north, while a small entrance lodge will occupy a position at the south-west corner of the site. The contract for the work has been taken by Messrs. Gould & Stevenson, of Leeds, for a trifle under 10,000*l*. Mr. William Watson, of Wakefield, architect and diocesan surveyor, is acting locally.

NEW LABORATORIES, LIVERPOOL.—New Analytical Laboratories are being erected in Highfield-street, Liverpool, for Messrs. Knight & Rawson, assayers, from plans prepared by Messrs. Mercer & Allender, Liverpool. Mr. James Crosbie, of 1, Mildred-street, Liverpool, is the contractor.

THE PRINCESS'S THEATRE, EDINBURGH, which was closed several years ago, has been acquired by "General" Booth for the Salvation Army. It presents no outward façade, but is situated behind the houses at the junction of Nicolson-street and Hill-place. The principal entrance is by a long and rather narrow passage through the houses from Nicolson-street, and a similar passage leads from Hill-place to the upper gallery. The situation was considered by the magistrates to be a very dangerous one in the event of a fire occurring, and a continuance of the licence was refused several years ago, since which time it has remained empty. There are two galleries, and a very awkward flight of steps leads down to the pit, which is about 8 ft. below the street level. It is proposed to level up the floor, and to do away with one of the galleries. The present entrances will be retained, and the staircase to the gallery rendered fireproof. The site of the stage is to be appropriated by a platform, band-room, officers'room, and retiring-rooms, and the interior will be redecorated. The cost of alterations is estimated at 1,500*l*.

CONSECRATION OF ST. PETER'S CHURCH, WARRINGTON.—The Church of St. Peter, Warrington, was consecrated on the 23rd inst. by the Bishop of Liverpool. The walls externally are faced with grey bricks, with quoins, cornices, and bands of deep red brick. Red terra-cotta is used for the window-sills and other parts. The roofs are slated and the ridges are of red terra-cotta. Close to the south-west porch is the baptistery, containing a sculptured font of red stone. In the arch which marks off the baptistery from the south aisle is ornamental ironwork, and over this, a cross. The chancel and chancel arch, and the windows north of the nave, are seen through the arcade which divides the aisle from the nave. The nave floor slopes up towards the east. The reredos is chiefly of cream-coloured stone. The central part is a vesica-shaped panel of red alabaster, in front of which is a white alabaster cross in relief. There are side panels of variegated alabaster, with the rose and lily inlaid. The reredos is finished above with a moulded and carved cornice. On the south side of the chancel is an arcaded wooden screen, occupying the arch between the chancel and its aisle. There are also sedilia and credence, the latter being in the east wall. The lower part of the walls is of brown glazed brick; above this the windows, doorways, and arches, &c., are of red brick. The circular pillars, two of which carry the large arches between the nave and aisle, are of red brick, and have quatre-foiled capitals of red stone, with symbolical carvings on the cardinal faces. The church has been built by Messrs. Statham, of Pendleton, and the cost, exclusive of the reredos and heating apparatus, has been 3,554*l*. The whole has been designed and superintended by the architect, Mr. Medland Taylor, of Manchester.

PROPOSED NEW BOARD SCHOOLS, CARDIFF.—Some new schools are shortly to be built on the corner of Court-road and Hereford-street, Cardiff. The style is Gothic, treated very plainly, the outer walls being of coursed Newbridge stone and Bath stone dressings, and the chimney-stacks of red brick. The schools are to be in two blocks,—the boys' and girls' school, a two-storied building, with the boys upstairs, and the infants' school of one story. The scheme embraces a cooking kitchen, laundry, and boys' workshop. The boys' and girls' schools have each accommodation for 380, with teachers' rooms, stores, &c. The infants' school has accommodation for 468, with teachers' room, &c. The total accommodation provides for 1,228 children. The schools have also marching corridors for drill purposes 11 ft. wide. The floor between the boys' and girls' schools is to be of concrete. The architect is Mr. J. P. Jones, of Cardiff.

LEEDS AND COUNTY LIBERAL CLUB.—On the 19th inst., members of the Leeds and County Liberal Club entered into occupation of their new club. The building, of which Messrs. Chorley & Connon are the architects, occupies a site in Quebec-street, opposite the site of the new Post-office. Externally the club is constructed of red terra-cotta, the design being a free rendering of Renaissance. The members' entrance is placed at the end of the front elevation nearest the Midland Station, and has flanking columns and pilasters surmounted by a pediment, with enriched spandrels. Each end of the building has a gable of different design and size. The corner of the club is finished by an octagon turret, with conical roof. We gave a double-page illustration of the building in the *Builder* for May 31, 1890.

RE-OPENING OF WESLEYAN CHAPEL, ASHFORD.—The re-opening, after internal changes, of the Wesleyan Chapel, in Bank-street, Ashford, took place on the 18th inst. In the rear part of the building a vestry has been placed in each corner, an organ-gallery has been constructed between these, a rostrum and communion space has been placed in front, while over the whole a semi-Gothic arch has been raised. Underneath the chapel considerable excavation has been done, whereby the schoolroom is made two-thirds larger. Mr. H. J. Jeffery was the architect, and Mr. H. Knock the builder.

PROPOSED NEW RAILWAY STATION, CHAPPEL.—The railway improvements at Chappel, Essex, are progressing rapidly. It is proposed to build a new station, with two platforms and footbridge, a new goods-shed, a signal-box, and four workmen's cottages, the total cost being estimated at about 8,000*l*.

THE DERBYSHIRE INFIRMARY.—At a meeting of the governors of the Derbyshire Infirmary, held on the 23rd inst., it was decided to pull down the present building, the sanitation of which has been proved to be deficient, and to erect new premises at a cost of 74,000*l*.

NEW BOARD SCHOOL, LOWER GORNAL.—On the 17th inst. the memorial stone of a Board School for boys, which is being erected by Mr. Gough, of Wolverhampton, in the Red Hall-road, Lower Gornal, Staffordshire, from designs prepared by Mr. A. P. Brevitt, architect, Wolverhampton, was laid by Mr. S. Wilkes, Chairman of the School Board. The building is arranged on the class-room system, and will cost about 2,700*l*.

PUBLIC BATHS, ST. HELENS, LANCASHIRE.—These baths have been recently completed from the design and specification of Mr. Geo. J. C. Broom, the Borough Engineer. They contain one large plunge for gentlemen, 101 ft. by 30 ft., contained in a building 112 ft. by 47 ft.; one for ladies, 48 ft. by 24 ft., in a building 60 ft. by 40 ft.; and thirty-nine private baths, waiting-rooms, office, caretaker's house, laundry, boiler-house, &c. The floor of the large baths is of cement, and a dado is provided round each, 6 ft. high, of salt-glazed bricks, so that the whole can be thoroughly cleansed with a hose. There is also a small washing bath, 10 ft. square, to the large bath, and this, and the two large baths, are lined with white glazed bricks from the Pant Brick Co., Ruabon, with three rows of blue bricks for diving lines. A shower-bath is provided for each of the private baths. The whole building is heated by steam, also the water in the large baths and hot-water tank for private baths. The cost of the building was 10,249*l*., this amount being equal to 5*l*. 17s. 1d. per square yard of area built upon, or 5·58d. per cubic foot contents. The Town Council voted Mr. Broom a bonus of 100*l*. for the work in December last. The contractors were Mr. John Whittaker, of St. Helen's, for the brick-work and fittings, and Messrs. Thomas Bradford & Co., of Manchester, for the heating and the whole of the laundry fittings. The principal sub-contractors were: for ironwork, Messrs. W. M. Ward & Co., Great Bridge; for woodwork, Messrs. John Rothwell & Sons, St. Helen's; for plumbing, Mr. G. H. Openshaw, Pendleton; for boilers, Messrs. Earnshaw, Heywood; and for white and salt-glazed bricks, the Pant Brick Co., Ruabon. Mr. John Sadler, Widnes, was the Clerk of Works.

PROPOSED ALTERATIONS AT THE BIRMINGHAM TOWN-HALL.—The Estates Committee of the Birmingham City Council have for some time had under consideration a scheme for the alteration and improvement of the Birmingham Town-hall. Messrs. J. A. Cossins & Peacock were called in to assist the committee, and the result of the deliberations was a report which embraces, besides the plan for the alteration of the entrances and the staircases, a scheme for the heating and ventilation of the hall, also for the improvement of the lighting, and lastly for the redecoration of the hall. The committee propose to pull down the existing stone stairs and landings now leading from the front lobby to the floor, the great gallery, and the basement, also to clear away the adjoining wooden pillars and arches, and a piece of the wall between the existing staircases and the hall; to raise the ceiling of the lobby 3 ft.; and to build a flight of seven marble or stone steps 16 ft. 6 in. wide, to ascend from the middle of the south lobby to the floor of the hall, the piers being set back 11 ft. from the inside from the front wall. At the head of this flight of steps it is proposed that there shall be three pairs of folding doors, and beyond them an inner lobby. To obtain the space necessary for this extension and for the staircases to the gallery, it is intended to encroach 7 ft. into the floor of the hall under the great gallery. For improving the means of approach to, and exit from, the great gallery, it is proposed to erect two stone staircases 5 ft. 6 in. wide, from the two rooms between the central lobby and the staircases to the side gallery. On the floor over the side lobbies it is proposed to construct two ante-rooms for ladies and gentlemen, and the floor of the cloak-room and the landing will be of concrete on iron girders. It is proposed to construct two flights of stone stairs from the central lobby to the basement, and to form an assembly-room and separate ladies' and gentlemen's cloak-rooms. It is also proposed to add to the means of egress to the orchestra, and to provide staircases giving firemen safer access to the roof. Improved heating apparatus will be provided, and provision for the installation of the electric light will be made. The cost of the various works will amount to 5,967*l*. In addition, the committee consider that the present affords a convenient opportunity for the cleaning and redecoration of the hall, and they suggest that it might be advisable for the work to be done, as opportunity arose, by capable students of the Municipal School of Art.

SANITARY AND ENGINEERING NEWS.

BARROW-ON-HUMBER.—The Sanitary Committee have just received the report of their Engineer, Mr. Sydney Turner, C.E., for draining the town with sanitary pipes, estimated to cost 1,700*l*.

SEWERAGE AND WATER SUPPLY, SWANSEA.—On the 11th inst., a Local Government Board inquiry was held at the Town-hall, Swansea, by Mr. Thomas Codrington, M.Inst. C.E., respecting the application of the Swansea County Borough Council to borrow 87,836*l*. for works of sewerage and water supply. The proposed sewerage improvements were explained by the officials of the Corporation. Certain objections to the scheme were heard, and at the conclusion of the inquiry Mr. Codrington observed that he would report in due course to the Local Government Board.

STAINED GLASS AND DECORATION.

WHELPLEY HILL CHURCH SCHOOL, BERKHAMSTED.—A series of seven stained glass windows has recently been erected in the chancel here. The central light, containing the figure of our Lord with a chalice, in the act of blessing, being supported in the two lights immediately on either side by the figures of Moses and David, while the four Evangelists in the side windows complete the very effective series. The windows have been designed and executed by Mr. Henry Edgley, of London, who is also responsible for the long brass plate beneath the centre light, with a suitable inscription in memory of the founder of the building.

NEW WINDOW, HOLY INNOCENTS' CHURCH, FALLOWFIELD.—A new stained glass window has just been placed in the apse of Holy Innocents' Church, Fallowfield, by Dr. and Mrs. Ward, of Fallowfield. The window is two light. In the one the subject is "The Annunciation, and in the other "The Nativity," whilst at the foot of the two is the presentation to St. Simeon. In the cinque-foil at the top of the window is a representation of a cherub. The work has been executed by Messrs. Lavers & Westlake, of London.

DECORATION OF CHANCEL, ST. PETER'S CHURCH, GLASGOW.—In this church, situate in Braid-street, a scheme of decoration in the chancel has just been completed. The decoration has been carried out under the direction of Messrs. George Walton & Co. The design and execution are the work of Miss Constance Walton, R.S.W., of Glasgow. The first group in the series of designs represents a group of worshippers, mediæval in character—a bishop, a knight, a priest, a king, and a woman. The second group consists of five of the apostles with their appropriate symbols. In the third group opposite are the remaining seven apostles. The fourth group deals with the "Noble Army of Martyrs," all bearing palms and wearing crowns of glory. In the fifth group at each side of the altar stand Cherubim and Seraphim.

NEW WINDOWS, EAST CROMPTON CHURCH, NEAR OLDHAM.—There has lately been added to this church two new windows from the works of Messrs. Clayton & Bell, of London. One of the new windows illustrates the work of the ministry, having pictures of St. John baptising and St. Paul preaching. The other window is to be called the "children's window." It portrays the blessing of little children and St. Timothy being instructed by his mother.

NEW STAINED GLASS WINDOWS, WORDSLEY PARISH CHURCH. — New stained-glass windows have just been erected in the Parish Church of Wordsley by Mr. Samuel Evans, of West Smethwick and Birmingham. The windows consist each of two lights with double tiers.

FOREIGN AND COLONIAL.

FRANCE.—On the cessation of the cold weather, the work on the new Hôtel des Téléphones at Paris has been commenced. The building is to be in the Rue Gutenberg, near the Hôtel des Postes. It will be a large mass of brick, iron and glass with no architectural character to speak of, and is expected to be completed in August next.——The Greek sculpture gallery at the Louvre has just been re-opened after having been for a long time closed to the public. It contains a great number of precious fragments of antique work, notably the fine statue of Juno discovered at Samos.——A committee has been formed at Arpagon to raise in this little town a statue to the General Milhaud who distinguished himself in the wars of the First Empire.——M. Auba, the sculptor, has finished his statue of General Raoult who was killed at Reischoffen in 1870. It will be erected at Meaux, the general's native town.——The Minister of Fine Arts has commissioned M. Pierre Ogé to execute, for the Palace of the Institut, a bust of M. Fustel de Coulanges.——The Société des Peintres-graveurs, of which M. Bracquemond is president will open its annual exhibition on April 1 in the Durand-Ruel Gallery.——The group of painters known under the name of "Les Amants de la Nature" will open their eleventh exhibition to-day (Saturday) at 8, Rue de Furstenberg.——The town of Narbonne has been the scene of a professional scandal happily rare, the Sous-Préfet of the town having dismissed M. Chauvet, the municipal architect, from his post on account of what are described as "irregularités graves."——The painter Gérome has had the misfortune to lose his son, a talented young artist of the age of five and twenty, who has died at Nice.——M. Henner, member of the Institut, has been appointed to the position in the Conseil Superieur d'Enseignement of the École des Beaux-Arts, left vacant by the death of Meissonier.——About 600 pictures of the French School will probably be sent to the forthcoming exhibition at Moscow.——Last week took place the funeral of M. Albert Lenoir, architect of the Musée de Cluny, and son of Lenoir the archæologist, who saved from destruction a great many ancient monuments and collected them in the Musée des Petits Augustins. M. Lenoir was ninety years of age. His son, M. Alfred Lenoir, is a sculptor of talent. M. Lenoir at one time filled the place of Sous-Directeur of the Ecole des Beaux-Arts.——M. Joseph Uchard, of Paris, architect of the church of Francis Xavier, is dead.——Other deaths to be recorded are those of M. Holbeaux, a retired Inspecteur-Général des Ponts et Chaussées, a few days ago, at the age of seventy; of M. Poisson, a decorative painter well-known by his work in various Parisian theatres; and of M. Jongkind, a landscape-painter Dutch by origin but French by adoption, who had studied under Isabey, and was an etcher of considerable power. He died at Côte Saint André, where he had lived for some years.——It is announced that M. Duplessis, the keeper of engravings at the National Library, is a candidate for the late Baron Haussmann's position in the Académie des Beaux-Arts, in opposition to M. Alphand.——The Commission charged with the enquiry into the Paris maritime canal project, and its effect on the Department of the Seine, has reported unanimously in favour of the project.

BERLIN.—In connexion with the exhibition of the model of the proposed cathedral, Prof. T. C. Raschdorff has now had twelve sheets of elevations, sections, and plans hung at the "Kunstgewerbe Museum." They have been drawn to scale of 1·100, treated monochrome, and show some fine draughtsmanship, especially of the sculptural decoration.——According to a letter of Mrs. Schliemann, the works of excavation at Hissarlik will not be continued by her until next year, her time being occupied with the editing of Dr. Schliemann's biography, which is to be published as soon as possible.——The Schliemann Collections at Berlin (presented 1881 and 1884), which are on exhibition at the "Voelkerkunde Museum," and which were visited by the Emperor last week, are at present the object of general interest. The exhibits, arranged under personal superintendence of the deceased donor, grouped under seven headings (according to the names given to the seven distinct towns Dr. Schliemann considered he had found above one another), and labelled according to this system with different coloured labels, occupy the numerous cases in two large halls, in the smaller one of which the gold work has been placed in a large steel safe.——As soon as the winter season of the Imperial court is over, the restoration and extension of the Royal "Schloss" is to be taken in hand. This huge block which, since 1538, has been continually subject to extensions and alterations, already covers 24,000 square mètres (superficial), although having numerous flights of roomy reception- and ball-rooms, cannot satisfy the requirements arising from the system of having constant Court pomp with large and small fêtes has been adopted by the Emperor.——The preliminary survey for the line of the proposed Berlin Sea Canal has been taken in hand, under the direction of Brth. Scheck, of Frankfort-on-Oder, the route chosen at present being the so-called Baltic one viâ Eberswalde and Stettin.

NEW FINNISH HOUSE OF PARLIAMENT.—The new Finnish House of Parliament at Helsingfors is now fully completed. It stands in close proximity to the Senate House and the Hall of Nobility, and has been designed by Herr Nyström, a prominent architect. The cost is 60,000*l.*—a considerable sum in that country. The building is only intended for the Three Estates, ecclesiastics, burghers, and peasants.

SWEDEN.—At the last meeting of the Building Association of Stockholm an important discussion took place upon the unsound state of the building industry in the capital. The building speculation now going on was greatly censured, and it was urged that qualified architects alone should be permitted to undertake the building of houses. Finally, it was suggested that building speculators should be compelled by law to furnish a guarantee for the payment of all material required before used. ——The Swedish Export Association having appointed an agent for Brazil, similar to others in South America, that official has already sold thirty wooden villas in Rio Janiero, to be shipped in the spring.——One of the oldest and historically interesting churches in Sweden, that of Vadstena, is to be restored at a cost of about 5,500*l.* It was formerly attached to the celebrated cloister of that name.——A fund is now being formed for the building of a Sailors' Home in Stockholm, towards which King Oscar has given 350*l.* ——The Municipality of Stockholm has decided upon purchasing certain lands for the improvement and regulation of thoroughfares, at a cost of 110,000*l.* This year a sum of 12,500*l* is to be expended upon new streets, &c.——The city of Helsingborg is to be lighted by electricity, being the first town in Sweden boasting this improvement. The installation will be effected by Messrs. Siemens & Halske, the well-known Berlin electrical engineers.——The port of Malmö, whence the chief communication between Sweden and the continent is carried on, is to be enlarged, three prizes of 445*l.*, 280*l.*, and 160*l.* being offered for the best plans.——The Swedish Government has dispatched an electrical engineer to this country and America for the purpose of studying and reporting the latest development of telephonic science.

ANTWERP.—A plan has been prepared for connecting Antwerp with the left bank of the Scheldt by means of two tunnels, Baron Sadoine being at the head of the concern. The cost of such an undertaking would be very great.

SWITZERLAND.—The Bundesrath has decided on having two separate designs made for the proposed new Houses of Parliament, by Professor Auer, of Berne, and Professor Bluntschli, of Zurich, respectively. In the competition, which was opened in 1885, Professor Bluntschli was awarded the first prize and Professor Auer the second, thirty-six designs having been sent in.——The lines of the old Basle Market-place are to be altered, and some new Municipal Buildings to be erected on one side of the place. A competition has been opened for the purpose of obtaining designs.

DRESDEN.—An Exhibition of Water-colours and Drawings, similar to the one held here last year, will be opened in 1892, under the auspices of the Saxon "Kunstgenossenschaft."

VIENNA.—A memorial monument is to be erected on one of the public places to the memory of the deceased Freiherr von Schmidt. A committee of the Austrian "Architekten-and Ing.-Verein" has taken steps to obtain a suitable site from the Municipality, and intends sending out subscription-lists in Germany and Austria.

ROME.—In a lecture on the Turin Architectural Exhibition, given at Hamburg, Baurath Zimmermann, the hon. president of the international jury, informed his audience that an Architectural Exhibition on a grander scale is to be held at Rome in the autumn of 1893.

RUSSIA.—The Anitschkoff Palace in St. Petersburg, where the Imperial family resides, is now lighted throughout by electricity, the installation being said to be the most perfect of any public building in Europe. A memorial to the Empress Catherine II. has just been unveiled at Simferapol, in commemoration of the annexation of the Crimea, which has cost 92,000 roubles. It consists of a pedestal of granite, upon which a huge bronze statue of the Empress is mounted.——A permanent international industrial exhibition will shortly be opened in Moscow. The buildings are situated in the most central part of the town. In connexion with the exhibition is a commercial bureau, which will undertake the sale of exhibits, receiving orders, &c.; in fact, act as a commercial agency for the exhibitors. A newspaper will be issued gratis in connexion with the undertaking.

NORWAY.—A work on "The Norwegian Stave Churches," by Professor L. Dietrichson, is shortly to be published at Christiania. It is a national work upon Norse architecture in the Middle Ages, accompanied by 250 illustrations, chiefly represented by the curious Stave churches, so well known to every tourist, and which seems to be the only style of architecture which Norway can claim as original. The work is the result of many years of labour, and is partly issued by official assistance. ——Work on the Throndhjem Cathedral continues, and by Easter the eastern nave will be ready for service. The work of restoration is now proceeding in the northern and southern sections and the tower. Some twelve years must, however, still elapse before the restoration is completed. The electric light has been introduced into the cathedral. ——An association has been formed in Christiania for the purchase and presentation to the Museum of Arts of ancient Norse silver works, which are now getting very scarce, through the eagerness of foreigners in acquiring such. Some valuable objects have been obtained for the museum.

MISCELLANEOUS.

BRITISH ARCHÆOLOGICAL ASSOCIATION.—At the meeting of this Association on the 18th inst., Mr. J. W. Grover, F.S.A., in the chair, Mr. Earle Way exhibited an interesting series of Roman articles of pottery found near St. George's Church, Southwark, including an almost perfect patera of fine black ware.—Mr. Macmichael described some curious badges of the earliest insurance offices, in illustration of his recent paper.—Mr. Loftus Brock, F.S.A., exhibited a collection of silver medals commemorating the principal events in the reign of Queen Anne, of great beauty and artistic design.—Mr. Howlett described various discoveries made in and near the old hostelry, the "Maid's Head," at Norwich, some of the articles found being exhibited. One of these was a portion of wall-papering of early date, printed with subjects in the manner of the early block books, and which had been attached to the wall by pins.—Dr. Fryer reported the discovery of some pre-historic flint implements at Mitchelsdean, mingled with objects of Romano-British date, the former having been probably brought to the spot by a landslip, the whole being covered with many feet of made ground.—A paper prepared by Mr. H. Syer Cuming, F.S.A.Scot., was then read, in his absence through illness, by Mr. W. de Gray Birch, F.S.A., on "Syllabub and the vessels from which it was partaken."—A second paper by Mr. A. Oliver was "On the Ancient Brass Monuments still remaining in the Churches of the City of London." The principal of these are in the old churches which escaped the great fire of 1666, St. Olave's, Hart-street; St. Andrew's, Undershaft; Allhallows, Barking; and St. Helen's, Bishopsgate. Carefully-executed rubbings of almost the entire series were exhibited and described in detail.

ENGLISH AND GERMAN COALS AT HAMBURG.—For some years past, writes a Hamburg correspondent, a fight has been going on in that city between English and German coal traders. In the last decade the imports have been as follows:—

	German. Tons.	English. Tons.
1880	338,710	1,025,500
1890	815,820	1,581,750

Thus the import of English coals is not quite double that of Germany, whilst ten years ago it was over three times as much. Last year the import of English coals was about the same as in 1889, viz., 1,580,546 tons, whilst from Westphalia 99,000 tons more were imported. It will, therefore, be seen that German coals are competing favourably with English in this important city—the "Liverpool of Germany." Probably a few years hence the import of both will be balanced. During recent years the prices of coal in this town have been abnormally high, and it is feared, from the unsettled state of the labour market in England as well as in Germany, that they will remain so. Naturally, this winter, when for a time all supply was cut off, prices rose enormously, the stocks here not being sufficient to meet a coal famine.

ROOD SCREEN, STAVERTON CHURCH.—The work of re-erecting the fifteenth-century rood screen at Staverton Church, situated on the Dart, between Totnes and Buckfastleigh, has just commenced. The screen was taken down some time ago and conveyed to Mr. Harry Hems's studios at Exeter. There the old oak work was cleaned—a new moulded cell substituted for the rotten and decayed one—and the whole unbroken length of 51 ft. groined from end to end on each side. On the top of the rood loft, and running the length of the screen, is a continuous gallery front facing west, having a height of 15 ft. from the ground, and consisting of a succession of recessed and groined niches. The restoration of this screen has been undertaken at a cost of nearly 1,000*l.* by an anonymous benefactor. Mr. F. B. Bond, of Bristol, is the architect, under whose direction the work is being carried out.

NORWAY.—The Norwegian stone industry in 1890 occupied a considerable force of men, and the quantity of stone exported was a little larger than in the previous year. However, the result has not been very satisfactory, as prices abroad were very low. It is estimated that about 36,000 tons of cut granite were exported, chiefly to London, the chief market for the stone. But the demand has been small, and prices, in consequence, depressed. Paving stone was in good demand, and prices remained fair. The export of the beautiful stone syenite now so much in favour with Norwegian architects did not increase in 1890, as the cost of blasting this material is very great, and the price, in consequence, prevents a very great demand. The stone also called "Labrador," is only found at Laurvig, on the Christiana fjord, but in a great variety of beautiful colours, including black, and is used for columns, plinths, &c.

COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

COMPETITIONS.

Nature of Work.	By whom Advertised	Premium.	Designs to be delivered.
*Drawings for Laying-out and Development of Property	West of England Land and Investment Trst, Limited	35l. and 15l.	Mar. 31
*New Markets and Abattoirs	Borough of Bury	Not stated	May 1
Storage Reservoir	Belper Watrworks Co.	do.	No date

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
*Alteration and Extension of School	Burton-on-Trent Sch.B	R. Churchill	Mar. 3
*Works and Materials	Lewisham Bd. of Wks.	*Official*	do
*Public Convenience, Albert-square	Manchester Corp.	do.	do.
Fittings to Library, Newton Heath	do	do.	do.
Boundary Wall	Plymouth, Devonport, & E. Stonehouse S.A.	J. L. Hodge	do.
Public Shelter, Bray, Ireland	.....	P. F. Comber	Mar. 4
Dwelling-house, Collargreen, Craigellachie, N.B.	.....	W. Thomson	do.
Yellow Pine (8 000 loads)	G. W. R.	*Official*	do.
New Road and Bridge	Tyrone Grand Jury	do.	Mar. 5
Alterations to Workhouse, Whiteheath, Maidstone	Hollingbourne Union	do.	do.
Alterations to Workhouse, Greenhouse,&c.	do.	do.	do.
Waterworks	Ballyvaughan (co. Clare) Union	.....	do.
Rail and Post Fence (2,000 yards)	Blaydon Local Board	Michael Hawdon	do.
Two Bridges, 50 ft. span, Breakings, Stapleton	LongtownHighwayBd.	Richd. Maxwell	Mar. 6
Warehouse, Norton Mills, Elland	.....	Horsfall & Williams	do.
Three Dwelling-houses and Shops, Alma-Vale-road, Clifton	.....	Alfred Harford	do.
Gasholder and Tank, Willington Quay	Walker and Wallsend Union Gas Co.	*Official*	do.
*Construction of Sewers	Folkestone Corp.	do.	Mar. 7
Dwelling-house, Allsn-grove, Carlisle	.....	Thos. Warwick	do.
Villa Residence, Slights, Whitby	John Linskill	Clark & Moscrop	do.
Granite Road Metal	Brixworth(Northampton) Highway Board	Thos. Gulliver	do.
*Works and Materials	St. Giles Bd. of Wks.	Geo. Wallace	Mar. 9
*Iron Fencing	Hendon Local Board	S. S. Grimley	do.
*Erection of House and Laundry	.....	.....	do.
New Institute, Runcorn	Mersey Mission to Seamen	*Official*	do.
*Works and Materials, Chatham	War Department	do.	do.
Repairs of Main Roads	Kent County Council	F. W. Ruck	Mar. 10
Alterations and Additions to Premises, Belfast	Belfast Library and Society for Promoting Knowledge	Young & Mackenzie	do.
Alteration of Buildings at the Workhouse	Newton Abbott Union	S. Segar	do.
*Works and Materials	Rotherhithe Vestry	*Official*	do.
*Main Drainage Extension Works	West Ham Council	Lewis Angell	do
*Boiler House, &c. (Main Drainage Extension)	do.	do.	do.
*Rustic Bridges and Fencing, Lewisham	LondonCountyCouncil	*Official*	do.
*Roadmaking and Paving Works	Hammersmith Vestry	H. Mair	Mar. 11
*Thirty New Almshouses, Chapel, &c.	Trustees of Waddington Hospital Charity	W. Watson	do.
*Construction of Reservoir	Winderuere Gas and Water Co.	J. Newton & Son	do.

CONTRACTS.—*Continued.*

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
*Road Materials and Team Labour	Norfolk County Coun.	*Official*	Mar. 11
Sewage Works, Tanks, &c.	Hyde Corporation	Joseph Mitchell	do.
Road Metal (1,240 yards)	Sevenoaks Local Board	Jabez Mann	do.
*Paving Works	Barking Town Loc. Bd.	C. J. Dawson	Mar. 12
Laying Gas Mains, Plant, &c.	Trim (Meath) T. C.	Hampden Shaw	do.
Flagging, Kerbs, Setts, &c.	Plymouth Corporation	G. D. Bellamy	do.
Additions and Alterations to Police Station, Willenhall	Staffordshire C. C.	W. H. Cheadle	Mar. 13
*Excavating and Levelling Earthworks	War Department	*Official*	do.
*Infectious Diseases Hospital	Borough of Blackburn	do.	Mar. 14
Whinstone Road Metal (1,500 tons)	Whitley and Monkseaton Local Board	do.	do.
*New Boilers to Hospital Ships	Met. Asylums Board	C. Thomson	do.
Iron Water Tank, Water Mains, Building Works, &c.	Rothwell Local Board	Mr. Starkie	do.
Re-building Three Bridges	Durham County Coun.	Wm. Crozier	do.
*Works and Materials	Colchester Twn Coun.	H. Goodyear	Mar. 16
*Erection of Baths and Washhouses	Islington Vestry	A. H. Tiltman	do.
*Works and Materials (Newcastle Sub-District)	War Department	*Official*	do.
*Works and Materials (Woolwich District)	do.	do.	do.
*Works and Materials (Gravesend Sub-District)	do.	do.	do.
*Sewers Works, Morden	Battersea Burial Bd.	do.	do.
Road Materials, &c.	East Sussex C. C.	Henry Card	Mar. 17
*Works and Materials	Tottenham Local Bd.	*Official*	do.
*Residence for Medical Superintendent	Wilts County Asylum	C. S. Adye	Mar. 18
*Works, Repairs, Building Materials, &c. Aldershot	War Department	*Official*	do.
*Making-up, Painting, and Enclosing Recreation Ground, &c.	Parish of St. Mary Abbotts, Kensington	do.	Mar. 23
*Works and Materials (Sheerness Sub-District)	War Department	do.	do.
*Sea Wall and Esplanade	Sandgate Local Board	W. L. Barrett	Mar. 25
Drill and Concert Hall, Portland-place, Penrith	.....	Geo. Watson & Son	No date
Fireproof Warehouse, Halifax	.....	Petty & Ives	do.
Reservoir, Halifax	.....	do.	do.
Six Houses, Lightcliffe, Halifax	.....	J. F. Walsh	do
Board Schools, Caretaker's House, &c. Blyth, Northumberland	.....	Chas. Walker	do.
Work at Fever Hospital	Leeds Corporation	*Official*	do.
Detached House and Stabling, Armley, Leeds	.....	C. H. Thornton	do.
House and Premises, Cogenhoe, Northampton	W. A. Mann	H. H. Dyer & Son	do.
Pitch Pine Flooring Boards (100 squares), Bridgend	Glamorgan Coun. Asy.	*Official*	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary	Applications to be in
Assistant Surveyor	Aston Manor Loc. Bd.	3l. per week	Mar. 4
*Superintendent of Night Scavenging	Stockton-on-Tees Corp.	Not stated	Mar. 10
Waterworks Overseer	Pembroke (Ireland) Town Commrs.	2l. 2s. per week	Mar. 12
District Surveyor	East Sussex C. C.	160l	Mar. 19
*Inspector of Nuisances and Others	Sanitary Institute	Not stated	Mar. 28
*Clerk of Works	Wilts County Council	do.	No date

Those marked with an Asterisk (*) are advertised in this Number. *Competitions, p.* iv. *Contracts, pp.* iv., vi., *and* viii. *Public Appointments, p.* xxi.

THE ENGLISH IRON TRADE.—The English iron market remains quiet on the whole, but there is a faint glimmer of hope with regard to the future. At present the tendency of prices is still downwards, if we except the pig-iron markets of the north and north-west. The Glasgow warrant market has been lifeless again, but it may at any moment be stirred into activity, should an upward movement be attempted by speculators, of which there are signs. Pig-iron continues dull and rather weak in the southern markets. Business in manufactured iron and steel is quieter if anything, makers complaining of its unprofitable nature. Shipbuilders are well engaged, but are booking but few fresh orders. Engineers are receiving fewer inquiries.—*Iron.*

ELECTRICITY BY WATER-POWER IN SWITZERLAND.—In Switzerland we hear that attempts are being made to utilise the numerous waterfalls in the country for working dynamos. For instance, at Lausanne, a company has just been formed for utilising a fall of 3,000 horse-power. The installations are nearly completed, and five factories are to be worked by electricity from the same.

MR. J. T. CHAPPELL'S STAFF DINNER.—The annual dinner and smoking concert of the staff of Mr. John T. Chappell, the well-known builder and contractor, of London and Brighton, took place last Saturday evening in the Venetian Chamber of the Holborn Restaurant. In the unavoidable absence of Mr. Chappell the chair was worthily filled by Mr. G. H. Chappell, who, being about to enter the bonds of wedlock, was during the evening made the recipient of a very handsome wedding present subscribed for by members of the staff. A very large party was present.

MONUMENT TO THE EMPEROR ALEXANDER II.—In the Imperial Square of the Kremlin, Moscow, a magnificent monument is now being erected in memory of Alexander II. abolishing serfdom. The Imperial statue, which will at night be illuminated by a number of electric glow-lamps, stands in a pillared hall open on three sides, whence marble steps flanked by walls lead down to the river. The foundation-stone of the hall is to be laid in May next, most probably simultaneously with the opening of the French Exhibition in Moscow. It is anticipated that the Czar will perform the ceremony.

A WATER-TANK NUISANCE.—It seems almost incredible, but it is nevertheless a fact, that there exists at the present time an old iron tank in New York, which has contained water (unused) for nearly 100 years. The history of that tank is interesting. The tank, which nearly fills the whole building of No. 25, Centre-street, was constructed by the Manhattan Company, under a charter obtained in 1798. At that time, a certain Aaron Burr and his political associates wished to establish a bank in opposition to the banks under the control of a certain Alexander Hamilton and his friends. Burr resorted to a trick, and caused the passage of an Act to charter a company with a capital of 2,000,000 dols., to supply water to New York, and with powers to engage in the East India trade, and to establish a bank. The Bank of the Manhattan Company became a permanent and useful institution, but the business of supplying water to the city went no further than the erection of the tank, which has been kept full of water ever since, in order to comply with the terms of the bank's charter. The tank has at last become a nuisance. It has been reported to the New York Board of Health that malaria has broken out in the neighbourhood, and the board has ordered an investigation in consequence of the complaint.

THE AMERICAN PRODUCTION OF STEEL.—The statistics prepared from the returns received by the American Iron and Steel Association from the manufacturers show that the output of Bessemer steel ingots in the United States in 1890 amounted to 3,681,728 gross tons (of 2,240 lbs.), which is 751,524 tons, or 25 per cent., more than in 1889, when the production was 2,930,204 tons. The American production of Bessemer steel rails last year was 1,797,489 tons, against 1,470,267 tons in the preceding year. The increase in production for 1890 was 327,222 tons, or 22 per cent., compared with 1889. The above figures show that, while the output of Bessemer steel ingots in the United States in 1890 was the largest in the history of the American iron industry, the production of Bessemer steel rails has only once been exceeded, and that was in 1887, the year of the railway boom, when the mileage of new track laid down exceeded 12,000 miles. The output of steel rails in that year was 2,101,904 gross tons.

THE BOMBAY GRAVING-DOCK.—That most valuable acquisition, a first-class graving-dock in India, is about to become an accomplished fact. According to the *Times of India*, the new Bombay dock will be ready for use in a week or two. The following are the particulars:—Length of floor, 500 ft.; extreme length available for docking purposes, 530 ft.; width at coping, 90 ft.; width at floor, 62 ft.; depth of dock at head, 33 ft.; available depth for docking at high-water, ordinary spring tide, 27 ft. 3 in.; width of entrance, 65 ft. 6 in. The work is described as very substantial, no less than 140,000 cubic feet of dressed stone and 32,000 cubic yards of rubble masonry having been utilised in the construction. The whole of the masonry is of rubble faced with ashlar, the stone used being the ordinary basalt found in the Island of Bombay, while the facing is of a similar description to that used in the retaining-wall of Victoria Docks. The stone used for forming the grooves by which the caisson is to be retained is Cornish granite, which has been taken from England for the purpose. The work comprised 95,000 cubic yards of excavation, and was all done by hand. The dock has been specially laid out with a view to accommodate such vessels as H.M.S. *Warspite* and *Imperieuse*. It will hold 7,000,000 gallons of water, and will be filled through culverts placed on either side of the entrance. There are three 36 in. centrifugal pumps, which will, if required, pump the dock out in three hours.

MEETINGS.

SATURDAY, FEBRUARY 28.

Architectural Association. — Visit to St. Philip's Church, Stepney.

Builders' Foremen and Clerks of Works' Institution.—Annual dinner, Holborn Restaurant. 6 p.m.

Royal Institution.—The Right Hon. Lord Rayleigh, M.A., F.R.S., on "The Forces of Cohesion." III. 3 p.m.

London Geological Field Class (Gresham College).—Professor H. G. Seeley, F.R.S., on "The Gravel Beds of the Thames and its Tributaries in relation to Ancient and Modern Civilisation." IV. 4.15 p.m.

MONDAY, MARCH 2.

Royal Institute of British Architects.—Special General Meeting to elect the Royal Gold Medallist for the current year. Followed by the ninth General Meeting. Paper by Mr. Somers Clarke, F.S.A., on "The Fall of One of the Central Pillars at Seville Cathedral." 8 p.m.

Surveyors' Institution.—Adjourned discussion on Mr. A. A. Hudson's paper on "Recent Legislation as to Buildings and Streets in London." 8 p.m.

Society of Engineers.—Mr. Arthur Rigg, on "The Balancing of High-speed Steam-engines. 7.30 p.m.

Society of Arts (Cantor Lectures).—Mr. Gisbert Kapp on "The Electric Transmission of Power." III. 8 p.m.

Clerks of Works Association (Carpenters' Hall).—Paper by Mr. W. Baker. 8 p.m.

Royal Institution. — General Monthly Meeting. 5 p.m.

Liverpool Architectural Society.—Mr. J. A. Berrington on "Foundations." 7 p.m.

Institution of Civil Engineers.—Students' Visit to the Locomotive and Carriage Works of the Great Eastern Railway, at Stratford. 2 p.m.

TUESDAY, MARCH 3.

Sanitary Institute (Lectures for Sanitary Officers).—Mr. J. F. J. Sykes on "General Powers and Duties of Inspectors of Nuisances." 8 p.m.

Institution of Civil Engineers. — Mr. J. Thornhill Harrison on "The Subterranean Water in the Chalk Formation of the Upper Thames, and its Relation to the Supply of London." 8 p.m.

Society of Biblical Archæology.—8 p.m.

Manchester Architectural Association.—Mr. Banister Fletcher, Jun., on "The Late Paris Exhibition." 7.30 p.m.

Glasgow Architectural Association.—Business Meeting. 8 p.m.

WEDNESDAY, MARCH 4.

Carpenters' Hall (Free Lectures to Artisans).—Professor J. M. Thomson on "Chemistry of Building Materials." 8 p.m.

Civil and Mechanical Engineers' Society.—Mr. J. H. Paul, B.Sc., on "The Prevention of Scale in Boilers." 7 p.m.

British Archæological Association.—1. The Rev. H. Barber on "The Parish of Ramsbury, Wilts." 2. Mr. J. H. Macmichael on "Tradesmen's Signs of Old London: Eastern portion." 8 p.m.

Society of Arts.—Mr. J. Harrison Carter on "Modern Flour Milling." 8 p.m.

THURSDAY, MARCH 5.

Royal Institution.—Professor C. Meymott Tidy on "Modern Chemistry in Relation to Sanitation." I. 3 p.m.

Society of Antiquaries.—8.30 p.m.

Royal Archæological Institute.—1. Paper by Mr. E. Peacock, F.S.A. 2. The Rev. J. Hirst on "Some Tombs in Crete of the Age of Mycenæ." 3. Mr. H. S. Cowper on "Objects Found in the Thames." 4 p.m.

FRIDAY, MARCH 6.

Architectural Association.—Paper by Mr. Basil Champneys. 7.30 p.m.

Sanitary Institute (Lectures for Sanitary Officers).—Mr. J. F. J. Sykes on "Objects and Methods of Inspection." 8 p.m.

Royal Institution.—Professor J. A. Fleming, M.A., on "Electromagnetic Repulsion." 9 p.m.

Society of Arts (Popular Afternoon Lectures).—Captain Abney, F.R.S., on "The Science of Colour." 4.30 p.m.

SATURDAY, MARCH 7.

Royal Institution.—The Right Hon. Lord Rayleigh, M.A., F.R.S., on "The Forces of Cohesion." IV. 3 p.m.

Edinburgh Architectural Association.—Visit to Saughton Mill and Saughton House.

RECENT PATENTS:

ABSTRACTS OF SPECIFICATIONS.

897.—OUTSIDE SEAT: *A. Greenaway.*—This invention relates to a sliding-seat for use in cleaning windows or for outside work. It is made in deal, with grooves for bearers to run in, and so constructed as to form a stop on outside of stone sill. When fixed, it stands level with stop-bead on the sash-sill, and is secured internally by a lever-latch or similar contrivance.

1,795.—IMPROVEMENTS IN WATER-CLOSETS: *W. Roff.*—This claims to be an improved elastic valve closet, the earthenware parts being formed in one piece, and the flushing valve, as also the valve at the bottom of the basin, being worked in an improved manner.

3,657.—DOOR CHECKS: *R. Morris.*—In the construction of this check, the cylinder is attached to a rod extending forwards along the door, and jointed thereto at a distance from the hanging stile, and the piston is attached by a crosshead to two side rods extending backwards, and jointed to a bracket projecting from the hanging style.

3,734.—IMPROVED CLOSETS FOR RAILWAY CARRIAGES: *O. Elphick.*—The seat is provided with a counterbalance weight, tending to gradually raise it when not held down. The seat carries an arm having a roller at its end, which, as the seat moves either way, passes across a valve, opening it, and admitting water to the pan. The seat has also pivoted to it one end of a connecting rod, which actuates one end of a bell-crank lever, the other end carrying the valve for closing the outlet to the pan.

5,310.—SLATE-ROOFING: *H. P. Sharp.*—One thickness only of slate is used. The rafters are rebated both sides as if for glazing with putty, leaving a raised fillet in centre of rafter. Milled lead strips of H section, the lower half fitting on the raised fillet or rafter, is secured with copper tacks. The slates are bedded in putty, and the flanges finished off with a tool made for the purpose.

6,895.—RAISING LADDERS, &c.: *C. Parker.*—This refers to a kind of portable winch, made to fix or clamp over cills, &c., to raise ladders, pianos, furniture, &c, in an easy manner.

17,795.—BUILDING MATERIAL: *F. Oschwald.*—The material is called "peat stone," and consists of disintegrated or comminuted peat and plaster of Paris, made into blocks which have considerable resisting power against compression, and are light, and also bad conductors of heat and sound, thus being useful in many positions where warmth and quietness are desired.

19,645.—SASH BALANCES: *R. M. Gardner.*—This specification refers to a device for fastening in the sash a metal or ribbon tape, which is thought to be better than cords or chains for hanging the sashes. The end of the ribbon is drawn through an orifice, turned back, and fastened by a wooden wedge.

NEW APPLICATIONS FOR PATENTS.

February 9.—2,313, J. Golding, Self-adjusting Sills for excluding Draughts from the bottom of Doors.—2,314, H. Schubert and R. Werth, Pneumatic Door-stop.—2,324, J. Hadfield, Window-sash Fastenings.—2,325, T. Smith and T. Sheldrake, Fastenings for Windows, Doors, &c.—2,362, H. Wilcox and others, Manufacture of White Lead, &c.

February 10.—2,382, G. Scollay, Paint or Paint Stock.—2,389, J. Perry. Socket-bolt for Securing Windows, Doors, &c.—2,435, W. Warne, Window Sash-fastener.—2,457, J. Hopper, Roofing Materials.

February 11.—2,494, R. Duncan, Door-stops.

February 12.—2,528, J. Holdsworth, Warming Air for Living-rooms, &c.—2,534, W. Parsey, Scaffolding.—2,536, J. Rae and J. Murdoch, Chimney-tops or Cans.—2,549, T. Bones, Glazed Roofs, &c.—2,554, W. Ingram, Spirit-levels.—2,559, J. Mewburn, Preventing the Slamming or Swinging of Doors.—2,563, G. Goldsmith, Chimney-cowls.

February 13.—2,591, J. Steen, Metal Screws for Woodwork, &c.—2,614, A. Howell, Window-sash Fasteners.—2,619, G. Downie, Smoke-consuming Apparatus.—2,638, S. Gelston, Grates or Fireplaces.—2,645, W. de Morgan, Fire-grates or fireplaces.—2,647, A. Lawrence, Moulding Artificial Stone-paving Slabs.—2 655, W. Beetham and J. Thomas, Chimney-cowl.—2,669, G. Redfern, Storm Doors.

February 14.—2,694, D. White, Filler for French Polishing.—2,700, W. Scott-Moncrieff, Waste-preventing Cisterns.—2,704, A. Lowy, Painting Stone, Wood, Metal, &c.—2,726, R. Duncan, Preventing the Slamming of Doors and the Rattling of Windows, Shutters, &c.—2,740, F. Prescetto, Flushing Apparatus.

PROVISIONAL SPECIFICATIONS ACCEPTED.

20,156, G. Parsons, Sash Fastener.—20,720, C. Darrah, Ventilating and Illuminating Shop-windows and Fronts. 537.—E. Brown, Door-handle Fastening.—665, W. Deeming, Sanitary Pipes, &c.—1,064, H. Lewis, Joiners' Bench Cramp.—1,247, J. Shanks, Lavatory or Washhand Basins.—1,601, T. Whittaker, Machines for Making and Pressing Bricks, &c.—1,750, C. Von Forell, Artificial Roman Cement.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to Opposition for Two Months.

3,882, T. Birtwistle and S. Bardsley, Safety Hinge for Folding Ladders, &c.—7,318, J. Bayly, Drainage and Water Supply System—13,134, C. Abel, Bricks, &c.—19,329, E. Edwards, Process for Making Imitation Walnut-wood.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

FEBRUARY 12.—By *Wilkinson, Son, & Welch* (at Brighton): No. 31, Bedford-sq., Brighton, f., r. 140*l.*, 2,300*l.*; No. 25, Regency-sq., f., r. 104*l.*, 1,700*l.*; 23, York-rd., Hove, f., r. 55*l.*, 870*l.*

FEBRUARY 16.—By *A. Richards:* Profit rental of 78*l.*, u.t. 11 yrs., g.r. 10*l.*, St. Paul's-rd., Highbury, 630*l.*—By *Elliott, Son, & Boyton:* 417 and 419, King's-rd., Chelsea, f., r. 90*l.*, 1,800*l.*

FEBRUARY 17.—By *H. Tilley:* "The Hope" public-house, St. John's-st., Smithfield, f., r. 120*l.*, 5,600*l.*—By *E. Holsworth:* 87, Darenth-rd., Stamford-hill, u.t. 92 yrs., g.r. 10*l.*, r. 55*l.*, 635*l.*—By *C. W. Davies:* 2, Mount Pleasant, Crouch-hill, u.t. 56 yrs., g.r. 3*l.* 10s., 350*l.*—By *Chinnock, Galsworthy, & Co.:* Nos. 423 and 424, and 1 and 2, Bedford-st., Strand, area 2,800 ft., 20,900*l.*—By *Fitch & Roger:* 43, Silverthorne-rd., Battersea, u.t. 85 yrs., g.r. 5*l.* 6s. 8d., 215*l.*—By *H. C. Newson:* 1 to 6, Connaught-rd., Ealing, u.t. 93 yrs., g.r. 4*l.*, 730*l.*; 7 to 17 (odd), Connaught-rd., u.t. 93 yrs., g.r. 4*l.*, 665*l.*; 1 to 7, Argyle-ter., Teddington, u.t. 91 yrs., g.r. 4*l.* 10s., r. 109*l.*, 305*l.*; the residence, "Bankside," Enfield-rd., Winchmore Hill, u.t. 88 yrs., g.r. 9*l.*, r. 45*l.*, 440*l.*—By *Reynolds & Eason:* 39, Gibson-sq., Islington, u.t. 36 yrs., g.r. 9*l.*, 395*l.*; 4, Southcote-rd., Camden Town, u.t. 78 yrs., g.r. 7*l.* 7s., r. 42*l.*, 450*l.*

FEBRUARY 18.—By *Norton, Trist, & Gilbert:* An improved rental of 461*l.*, Savoy-st., Strand, u.t. 30 yrs., 7,200*l.*; an improved rental of 274*l.*, u.t. 30 yrs., Lancaster-pl.; an improved rental of 239*l.*, u.t. 30 yrs., with reversion for 28 yrs.; improved rental of 86*l.*, same term, with reversion for 6 yrs.; improved rental of 259*l.*, same term, with reversion for 15 yrs., 12,900*l.*—By *Douglas Young:* 14 to 20 (even), Speenham-rd., Brixton, u.t. 90 yrs., g.r. 31*l.*, r. 160*l.*, 1,400*l.*—By *Towers, Ellis, & Co.:* 6, Connaught-st., Hyde-pk., u.t. 23 yrs., g.r. 18*l.* 18s., r. 120*l.*, 1,220*l.*; 13, Howley-pl., Maida-hill, u.t. 46 yrs., g.r. 15*l.*, 375*l.*—By *R. J. Collier:* 45, High-st., Poplar, f., r. 36*l.*, 450*l.*; No. 134, Hackney-rd., f., r. 46*l.*, 670*l.*—By *Edwin Smith & Co.:* 8, Hanover-st., Hanover-sq., f., r. 650*l.*, 12,000*l.*; 98, Eaton-pl., Belgravia, u.t. 33 yrs., no g.r., r. 400*l.*, 5,000*l.*; i.g.r. of 100*l.*, Portland-pl., u.t. 20 yrs., g.r. 10*l.*, 1,120*l.* By *Fuller, Horsey, Sons, & Cassell:* F. plot of garden ground, 1a. 0r. 35p., Barrington, Cambs, 130*l.*; nine acres of f. allotment land, 145*l.*; a plot of f. allotment land, 60*l.*

FEBRUARY 20.—By *Ball, Norris, & Hadley:* 97, Endlesham-rd., Balham, u.t. 82 yrs., g.r. 7*l.*, r. 28*l.*, 245*l.* By *A. Booth:* 81, Brecknock-rd., Camden-rd., u.t. 49 yrs., g.r. 8*l.*, 340*l.* By *C. & H. White:* 2 and 4, Wynne-rd., Brixton, f., r. 173*l.* p.a., 1,625*l.*; 48, Chryssell-rd., u.t. 9 yrs., g.r. 5*l.*, r. 30 p.a., 100*l.*; 72 and 74, Ingleton-st., u.t. 12 yrs, g.r. 5*l.* 6s. 9d., r. 41*l.* 12s., 120*l.*; No. 162, Wandsworth-rd., u.t. 7 yrs., g.r. 7*l.*, 45*l.*

[*Contractions used in these lists.*—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; yd. for yard, &c.]

PRICES CURRENT OF MATERIALS.

TIMBER.

Greenheart, B.G.	ton	6/10/0 7/15/0
Teak, E.I...	load	8/10/0 14/0/0
Sequoia, U.S.	ft.cu.	2/3 3/0
Ash, Canada	load	2/10/0 4/5/0
Birch, do.		2/5/0 4/5/0
Elm, do.		3/10/0 4/15/0
Fir, Dantsic, &c.		2/0/0 3/15/0
Oak, do.		2/10/0 4/10/0
Canada		4/17/6 6/10/0
Pine, Canada	red	2/10/0 3/10/0
Do, yellow		2/0/0 5/10/0
Lath, D'antsic, &c.	fath	5/0/0 6/0/0
St. Petersburg		5/0/0 7/0/0
Deals, Finland,		
2nd & 1st	std	7/0/0 10/0/0
Do, 4th & 3rd		7/0/0 8/0/0
Do. Riga		6/0/0 7/10/0
St. Petersburg, 1st yellow		9/0/0 14/0/0
Do. 2nd yellow		8/0/0 9/0/0
Do. white		6/10/0 10/0/0
Swedish		6/10/0 15/0/0
White Sea		8/0/0 16/10/0
Canada, Pine 1st		13/0/0 24/0/0
Do. do. 2nd		9/0/0 15/10/0
Do. do. 3rd, &c.		6/10/0 10/0/0
Do. Spruce. 1st		8/10/0 10/10/0
Do. do. 3rd & 2nd		6/0/0 7/10/0
New Brunswick		5/0/0 7/0/0
Battens, all kinds		4/10/0 15/10/0
Flooring Boards, sq., 1 in. prep. 1st		0/10/0 0/14/0
Do. 2nd		0/9/0 0/10/6
Other qualities		0/5/0 0/7/6
Cedar, Cuba	ft.	3/8 4/4
Honduras, &c.		4/4 4/4
Mahogany, Cuba.		4/4 6/8
St. Domingo, cargo av		4/4 6/4
Mexican do. do		4/9 5/4
Tobasco do. do		5/5 6/4
Honduras do.		5/5 6/4
Box, Turkey	ton	4/0/0 13/0/0
Rose, Rio		12/0/0 19/0/0
Bahia		10/0/0 18/0/0

TIMBER (*continued*).

Satin, St. Domingo	ft.	0/0/9 0/1/3
Porto Rico		0/0/10 0/1/6
Walnut, Italian		0/0/4 0/0/7

METALS.

IRON—Bar, Welsh, in London	ton	6/5/0 6/15/0
Do. do. at works in Wales		5/15/0 6/5/0
Do. Staffordshire, in London		6/5/0 7/0/0
COPPER—British, cake and ingot		56/0/0 57/0/0
Best selected		59/0/0 60/0/0
Sheets, strong		66/0/0 0/0/0
Chili, bars		52/10/0 0/0/0
YELLOW METAL	lb.	0/0/6 0/0/6½
LEAD—Pig, Spanish	ton	12/12/6 0/0/0
English, com. brands		12/15/0 0/0/0
Sheet, English, 3 lbs. per sq. ft. and upwards		14/10/0 15/0/0
Pipe		15/0/0 0/0/0
ZINC—English sheet	ton	27/10/0 0/0/0
Vieille Montagne		28/5/0 0/0/0
TIN—Straits		90/10/0 0/0/0
Australian		90/15/0 0/0/0
English Ingots		94/10/0 0/0/0

OILS.

Linseed	ton	21/10/0 22/15/0
Cocoanut, Cochin		36/0/0 0/0/0
Do. Ceylon		29/0/0 0/0/0
Palm, Lagos		25/10/0 0/0/0
Rapeseed, English pale		28/15/0 29/0/0
Do. brown		27/5/0 27/10/0
Cottonseed ref.		19/0/0 0/0/0
Oleine		21/15/0 24/0/0
Lubricating, U.S.		6/0/0 7/0/0
Do. refined		7/10/0 12/0/0
TAR—Stockholm	barrel	1/1/6 1/2/0
Archangel		0/14/6 0/0/0

TENDERS.

[Communications for insertion under this heading must reach us *not later than* 12 *noon on Thursdays.*]

BUILTH WELLS.—For the erection of two houses, Castle-street, Builth Wells, Radnor, for Mr. Evan Evans. Mr. Telfer Smith, architect, 5, Market Hall-buildings, Builth Wells:—

Henry Price	£795 0 0	Henry Owen	£836 0 0
John D. Williams	774 10 0	Thomas Jones, Builth*	600 0 0
Alfred Meredith	659 0 0		

* Accepted.

CRICKHOWELL.—For the erection of a public-hall and caretaker's cottage, for the Public-hall Company, Limited. Mr. E. A. Johnson, architect, Abergavenny. Quantities by the architect:—

T. Watkins & Jenkins	£2,300	D. C. Jones & Co.	£1,984
T. S. Foster	2,260	J. D. Williams, Knighton*	1,856
J. G. Thomas	2,195	T. Jones & Son	1,819
H. Smith	1,984		

* Accepted (amended tender).

DROXFORD (Hants).—For making alterations, constructing additional quarters and fire escape exits at the Workhouse, for the Guardians. Mr. A. E. J. Guy, architect, 79, Albert-road, Southsea:—

W. Learmouth	£190 12 2	T. P. Hall	£178 6 4
H. Meredith	180 16 6	Thomas Westbrook,	
Read	180 15 0	Droxford (accepted)	163 5 0

DUNDALK.—For the construction of main drainage sewers, manholes, &c, for the Town Commissioners. Mr. J. Gaskin, Town Surveyor, Town-hall, Dundalk:—

James Wynne	£4,852 2 6	A. Whelan	£4,504 12 0
Collen Brothers	4,739 0 0	Hegarty & Gault,	
J. McAdovey	4,512 7 6	Ballymena*	4,128 6 1

*Accepted. [Surveyor's estimate, £4,181.]

EALING.—For alterations to "Little Haven," for Major-General Collinson. Mr. Chas. Granville Baker, architect, 5, Bloomsbury-square:—

Myring	£275 0 0

FINCHLEY.—For building stables, coachhouse, &c., at Church End, Finchley. Mr. F. D. Thomson, architect and surveyor, Woodside Park, Finchley, N.:—

Smith & Son	£587	Voller	£449
Brown & Sweetland	495	Wheeler & Co.	420

FINCHLEY.—For alterations to premises, High-street, North Finchley. Mr. F. D. Thomson, architect and surveyor, Woodside Park, Finchley, N.:

Smith & Son	£598	Voller	£359
Brown & Sweetland	449	Wheeler & Co.	352

FRIMLEY.—For the erection of cottage, stabling, &c., for Mrs. Lyne. Mr. H. Blackbourn, architect:—

Killby & Gayford	£4,589	Crask	£4,457
Gale	4,754	Watson	4,192
Smith	4,616	Finch	4,128
Sabey & Son	4,573	B. E. Nightingale	4,050
Charteris	4,570	Kemp	3,933
Harris & Son	4,515	Spice & King	3,898
Martin & Wells	4,505		

GUISELEY (Yorks).—For the erection of Wesleyan chapel and schools at Park View. Mr. Herbert Isitt, architect, 41, Sunbridge-road, Bradford, Yorks:—

Mason—J. Flesher, Guiseley	£532 0 0
Joiner—J. Deacon, Shipley	539 15 0
Plumbers—G. & R. Minns, Rawdon	139 5 0
Plasterer—A. Firth, Yeadon	60 0 0
Slater—W. Walker, Westgate, Otley	157 8 0
Painter—E. W. Walker, Thackley	25 0 0

HINCKLEY.—For the construction of about 530 yards of 12-inch, and about 150 yards of 6-inch pipe drainage, &c., at Barwell, for the Hinckley Union Rural Sanitary Authority. Mr. W. D. Bennett surveyor:—

Henry Hewitt	£225 0 0	Atkinson	£180 0 0
C. Daffern	185 13 10	J. Lockey, Barwell*	170 0 0

* Accepted.

LEICESTER.—For alterations and additions to the Mellor-street Board School, for the Belgrave School Board. Mr. Edward Burgess, architect, 6, South-square, Gray's Inn, London, W.C.:—

James Sills & Son	£3,960 0 0	Harry Bland	£3,679
F. Major & Son	3,798 14 0	J. Hutchinson & Sons	3,544
T. Richardson & Son	3,794 0 0	J. C. Kellett & Son	3,520
Thos. Warren	3,780 0 0	Thos. & Hy. Herbert,	
Clark & Garrett	3,766 0 0	Leicester (accepted)	3,485

LONDON.—For the erection and completion of New French Protestant Church, Soho-square, W. Mr. Aston Webb, architect:—

Cubitt	£11,270	B. E. Nightingale	£10,795
Hall, Beddall, & Co.	11,230	Dove Bros.	10,745
Ryder & Son	11,070	J. Bentley	10,286
Shillitoe	10,895	Higgs & Hill	10,194

LONDON.—For the erection of a new Police Station at Rodney-road, for the Receiver for the Metropolitan Police District, Mr. John Butler, architect. Quantities by Mr. W. H. Thurgood:—

Patman & Fotheringham	£5,812	Scrivener	£5,563
Colls & Son	5,799	Lathey Bros.	5,600
Perry & Co.	5,727	J. Smith & Son	5,537
J. T. Chappell	5,720	Higgs & Hill	5,444
Grover & Son	5,717	Nightingale	5,451
Hart Bros.	5,691	Ansell	5,445
J. Thompson	5,589	Garlick & Horton	5,120

LONDON.—For the extension and completion of the Church of the Sacred Heart, Camberwell New-road, S.E. Mr. Fred. A. Walters, F.S.A., architect:—

Hill Bros.	£3,155	Longley & Co.	£2,745
Lewis & Co.	3,059	Gregory & Co.	2,547
Smith & Son	2,793	B. E. Nightingale	2,498
Ryder & Son	2,756		

LONDON.—For the erection of new buildings, Horseferry-road, S.W., for Messrs. J. Broadwood & Sons. Mr. C. W. Stephenson, architect:—

Blyton	£4,242	Gerrard	£3,767
Ryder & Son	3,978	Patman & Fotheringham	3,691
B. E. Nightingale	3,833	Downs	3,687

LONDON.—For the erection of a granary at Battersea, for Mr. A. F. Hall. Mr. Robert Burr, architect, 25, Fulham-park-gardens, S.W. Quantities supplied:—

Jarvis & Sons	£5,095	W. Johnson	£4,830
Holloway Bros.	5,002	Godfrey & Son	4,768
Turtle & Appleton	4,920	W. Hammond	4,473
Killby & Gayford	4,887	Wells & Son	4,460
Thos. Gregory & Co.	4,838		

LONDON.—For the erection of a shop and store at Battersea, for Mr. A. F. Hall. Mr. Robert Burr, architect, 25, Fulham-park-gardens, S.W. Quantities supplied:—

Godfrey & Son	£778	W. Johnson	707
Jarvis & Sons	756	Thos. Gregory & Co.	673
Killby & Gayford	750	W. Hammond	655
Holloway Bros.	731	Wells & Son	594
Turtle & Appleton	730		

LONDON.—For additions and repairs to Devonshire House, Vicarage-road, Battersea, for Mr. A. F. Hall. Mr. Robt. Burr, architect. 25, Fulham-park-gardens, S.W.:—

Killby & Gayford	£499	Jarvis & Sons	£392
Turtle & Appleton	450	Godfrey & Son	388
Thos. Gregory & Co.	436	W. Hammond	363
Holloway Bros.	434	Wells & Son	310
W. Johnson	400		

LONDON.—For asphalting Farm-lane, Fulham, with 2-in. compressed asphalte on 6-in. concrete, area 1,540 square yards, for the Vestry of Fulham. Mr. James P. Norrington, Surveyor to the Vestry:—

French Asphalte Co.	£1,129 5 0	Limmer Asphalte Co.	£1,175 5
Val de Travers	1,172 15 0		

LONDON.—For completing baths and laundry, Mansford-street, Bethnal Green, E., for Messrs. Garner & Halley. Mr. J. G. Needham, architect, 11, Powerscroft-road, Clapton, E. :—

N. Thomas	£1,950	J. & F. Bane*	£1,375
S. W. Hawkings	1,788		

* Accepted.

LONDON.—For building new premises, for Messrs. Hills & Chapman, 709B, Old Kent-road, S.E. Mr. F. A. Powell, architect :—

T. A. Rodwell	£2,195	D. S. Whitcher	£1,930
T. Lapthorne & Co.	2,159	H. Burman & Sons*	1,890
J. Stayner	2,147		
Holliday & Greenwood	1,994		

* Accepted.

LONDON.—For alterations and repairs to 67, Watney-street, St. George's, East, for Mr. George Whitmill. Mr. Fred. A. Ashton, architect, Stratford :—

North Bros.	£385	M. Calnan & Co.	£347
J. & H. Cocks	375	J. & F. Bane (accepted)	276
J. H. Hearle & Son	352	M. A. Palmer & Co.	275

LONDON.—For the making up, channelling, tar paving, &c., of Poplar's-avenue, Willesden-lane, for the Willesden Local Board. Mr. O. C. Robson, Surveyor :—

Neave & Son	£448	Ballard	£377
Nowell & Robson	397	Bell	369

LONDON.—For pulling down and rebuilding three cottages at New King's-street, Deptford, for Mr. George Beck :—

A. Wilson & Co., Braxfield-road, Brockley* £815

* Accepted subject to deduction.

LONDON.—For pulling down Nos. 35 and 37, Hoxton-street, Hoxton, and building furniture warehouse and workshops for Mr. Sydney F. Sloper. Mr. Fred. G. Grierson, architect, 9, Old Jewry-chambers, Cheapside, E.C. :—

Evans & Co., Tavistock-place, Russell-square, W.C.* £1,200 0 0

* Accepted.

LONDON.—For rebuilding No. 68, New Park-street, Southwark, Mr. Martin L. Saunders, architect :—

Smith & Son.	£1,142	S. J. Gerrard	£1,043
B. E. Nightingale	1,072		

LONDON.—For alterations, &c., to 50, Brompton-square, S.W. Mr. C. J. Bentley, architect :—

Lansdowne & Co.	£1,347	J. Briant	£1,217
Balaam Bros.	1,269	Marriage	1,200
B. E. Nightingale	1,219	S. Hunt	1,193

LOUGHTON.—For new infants' school, for the Loughton School Board. Mr. James Cubitt, architect :—

Channing & Son	£2,575	Wells	£2,190
Rice	2,506	Watson	2,189
Foster	2,369	Lawerence	2,184
Coxhead	2,297	Arch. Ansell	2,075
Carter	2,240	Chessum	2,060
Gregar & Son	2,230	Everitt & Son*	1,973
Hall	2,209		

* Accepted.

PORTSMOUTH.—For the removal of gardener's lodge and re-erecting the same at Stamshaw Recreation Ground, for the Urban Sanitary Authority. Mr. Philip Murch, Borough Engineer, Town Hall, Portsmouth :—

J. E. Nobes & Son	£248 0 0	A. Hunt†	£98 15 6
T. P. Hall	230 0 0		
W. Learmouth*	183 6 0		

* Accepted. † Withdrawn.
[All of Portsmouth.]

ST. LEONARD'S-ON-SEA.—For the erection of a new Wesleyan Chapel, New Park-road, St. Leonards-on-Sea. Mr. Philip Hy. Tree, architect :—

W. G. Morgan	£4,350	Eldridge & Cruttenden	£3,537
F. Jenkins	4,195	H. E. Cruttenden	3,439
Taylor Bros.	3,710		

SHEFFIELD.—For the erection of a boundary-wall, asphalting playground, and alterations to buildings at Crofts Board School, for the School Board.

W. May	£208 0	Ash, Son, & Biggin, Sheffield†	£184 0
J. Holmes	352 10		
G. Longden & Son	212 0		
A. Smith*	0 0		

* Only quoted for portion of work.
† Accepted.

SOUTHEND.—For alterations and additions to the Meniva Hotel, for Messrs. Luker & Co. Mr. Edward Wright, architect :—

Archibald Ansell	£995	Orfeur	£820
Dark & Son	917	Dupont, Colchester*	800
Baker & Wiseman	887		

* Accepted.

SOUTHEND.—For new offices at Southend Station, for the G.E. Railway Company :—

Archibald Ansell, Billericay (accepted) £373 0 0

STRATFORD.—For erecting new granary, offices, stabling, &c., for Messrs. Gould Bros., Bow-bridge Wharf, Stratford, E. Messrs. Ransome & Unwin, architects, 297, Amhurst-road, N. :—

H. Wells & Sons	£3,239	J. H. Johnson	£2,629
J. R. Hunt	2,985	F. J. Coxhead	2,619
G. Sharpe	2,980	J. & H. Cocks, Mile End	2,618
Holliday & Greenwood	2,844		

SYDENHAM.—For additions, &c., to the "Prince Alfred," Lower Sydenham. Mr. Fredk. West, architect, Croydon :—

Waddington & Co.	£195 0	T. W. Jones	£149 15
Golder & Glasgow	175 0	Bryan & Son	141 0

TOTTENHAM.—For the erection of a Salvation Army Citadel for General Booth. Mr. Gillbee Scott, architect, 101, Queen Victoria-street.

Sayer	£2,207	W. Tout	1,480
Munday & Co.	1,750	French & Ellwood	1,448
A. Monk	1,718	E. Jarvis	1,398
Knight & Son	1,632	F. J. Coxhead	1,377
E. Houghton	1,596	Avis & Son	1,365
J. Linzell	1,493	A. Martin	1,340

USWORTH (Durham).—Accepted for the erection of miners'-hall, institute, &c., at Usworth Colliery. Messrs. Davidson & Bendle, architects, 33, Grainger-street West, Newcastle-on-Tyne :—

Mason and Bricklayer.—William Johnston, Flint Hill, co. Durham	£1,170	8	0
Carpenter and Joiner.—Wm. Surtees, Blackhill, co. Durham	378	0	0
Slater.—John Hewitson, Newcastle	127	0	0
Plasterer.—Wm. Johnston, Flint Hill, co. Durham	94	0	0
Plumber.—L. Unwin, Shotley Bridge, co. Durham	73	0	0
Painter and Glazier.—John Thirlwell, Shotley Bridge,	42	2	0

WAKEFIELD.—Accepted for re-roofing the dyehouse at Providence Mills, for Messrs. Geo. Lee & Sons, Limited. Mr. William Watson, architect, Barstow-square, Wakefield :—

Brickwork—Flower Bros.	110	0	0
Slating—C. F. Rycroft	151	10	0
Carpenter and Joiner—Chas. Squires	773	10	0
Plumbing, Glazing, &c.—Ed. Kirk	260	10	0
Painting—C. Turner & Sons	37	10	0
Total	£1,335	0	0

[All of Wakefield. Thirty-four tenders received.]

WARWICK.—For building four houses for the Warwick and Warwickshire Building Society. Mr. F. P. Trepess, architect, 8, Jury-street, Warwick. Quantities supplied :—

Fell	£1,070 0 0	Chapliu	£830 0 0
Atkinson	900 0 0	Robbins	798 10 0
Talliss	898 0 0	Lee, Leamington*	600 0 0
Bailey	844 16 0		

* Accepted.

WOBURN.—For building stables to "Wavendon Towers," for Lieut.-Col. Burney. Mr. Chas. Granville Baker, architect, 5, Bloomsbury-square :—

Samuel Foster, Bedford £540 0 0

YORK.—For the erection of a wall palisading and gate, Tulford-road, for the Corporation. Mr. Alfred Creer, C.E., City Surveyor, Guildhall, York :—

J. Hebden £118 14 5

YORK.—For the supply and erection of two cab-shelters, for the Corporation. Mr. Alfred Creer, City Surveyor, Guildhall, York :—

B. Hughes, York £102 1 4

Conveniences, Newington.—Mr. J. G. Stidder asks us to rectify a clerical error in his tender for London for conveniences at Great Dover-street for the Newington Vestry, in the *Builder* of February 14. It should read 1,945*l.* 18s.

SUBSCRIBERS in LONDON and the SUBURBS, by prepaying at the Publishing Office, 19s. per annum (or 4s. 9d. per quarter), can ensure receiving "The Builder" by *Friday Morning's post.*

TERMS OF SUBSCRIPTION.

"THE BUILDER" is supplied DIRECT from the Office to residents in any part of the United Kingdom at the rate of 19s. per annum PREPAID. To all parts of Europe, America, Australia, and New Zealand, 26s. per annum. To India, China, Ceylon, &c. 30s. per annum. Remittances payable to DOUGLAS FOURDRINIER, Publisher, No. 46, Catherine-street W.C.

W. H. Lascelles & Co.

21, BUNHILL ROW, LONDON, E.C.

Telephone No. 270.

HIGH-CLASS JOINERY.

LASCELLES' CONCRETE,

Architects' Designs are carried out with the greatest care.

CONSERVATORIES
GREENHOUSES,
WOODEN BUILDINGS,

Bank, Office, & Shop Fittings

CHURCH BENCHES & PULPITS

ESTIMATES GIVEN ON APPLICATION.

TO CORRESPONDENTS.

E. D.—H. & R.—A. E. K. (drawing shall appear if space permits).—"Combination Lock" (we cannot notice anything of this kind on the basis of a description forwarded with no address and no diagram or specimen of the lock).—C. S. (too late for this week).—J. B. (ineligible for insertion on account of non-compliance with our rules).

All statements of facts, lists of tenders, &c. must be accompanied by the name and address of the sender, not necessarily for publication.

We are compelled to decline pointing out books and giving addresses.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

We cannot undertake to return rejected communications.

Letters or communications (beyond mere news-items) which have been duplicated for other journals, are NOT DESIRED.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; all communications relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

BEST BATH STONE.

CORSHAM DOWN. | FARLEIGH DOWN.
BOX GROUND. | COMBE DOWN.
WESTWOOD GROUND. | STOKE GROUND.

THE BATH STONE FIRMS, Limited.
HEAD OFFICES: BATH.

DOULTING FREESTONE.

THE CHELYNCH STONE. The stone from these quarries is known as the "Weather Beds," and is of a very crystalline nature, and undoubtedly one of the most durable stones in England.

THE BRAMBLEDITCH STONE. Is of the same crystalline nature as the Chelynch Stone, but finer in texture, and more suitable for fine moulded work.

Prices, and every information given, on application to CHARLES TRASK & SONS, Doulting, Shepton Mallet.

London Agent—Mr. E. A. WILLIAMS, 16, Craven-street, Strand, W.C. [ADVT.

HAM HILL STONE.

The attention of Architects is specially invited to the durability and beautiful COLOUR of this material. Quarries well opened. Quick despatch guaranteed. Stonework delivered and fixed complete. Samples and estimates free. Address, The Ham Hill Stone Co., Norton, Stoke under-Ham, Somerset. London Agent: Mr. E. A. Williams, 16, Craven-st., Strand, W.C. [ADVT.

Asphalte.—The Seyssel and Metallic Lava Asphalte Company (Mr. H. Glenn), Office, 42, Poultry, E.C.—The best and cheapest materials for damp courses, railway arches, warehouse floors, flat roofs, stables, cow-sheds, and milk-rooms, granaries, tun-rooms, and terraces. Asphalte Contractors to the Forth Bridge Co. [ADVT.

SPRAGUE & CO.,
LITHOGRAPHERS AND PRINTERS,
Estate Plans and Particulars of Sale promptly executed.
22, Martin's-lane, Cannon-street, E.C. [ADVT.

MICHELMORE & REAP,
Manufacturers of

COLLINGE'S PATENT HINGES,
LEVER, SCREW, & BARREL BOLTS,
Self-Acting "FALL DOWN" GATE STOPS,
and IMPROVED GATE FITTINGS of every description.
36A, BOROUGH ROAD, LONDON, S.E.
PRICES REDUCED. LIST SENT ON APPLICATION.

TWELVE GOLD AND SILVER MEDALS AWARDED.

ZINC AND COPPER ROOFING.

F. BRABY & CO.

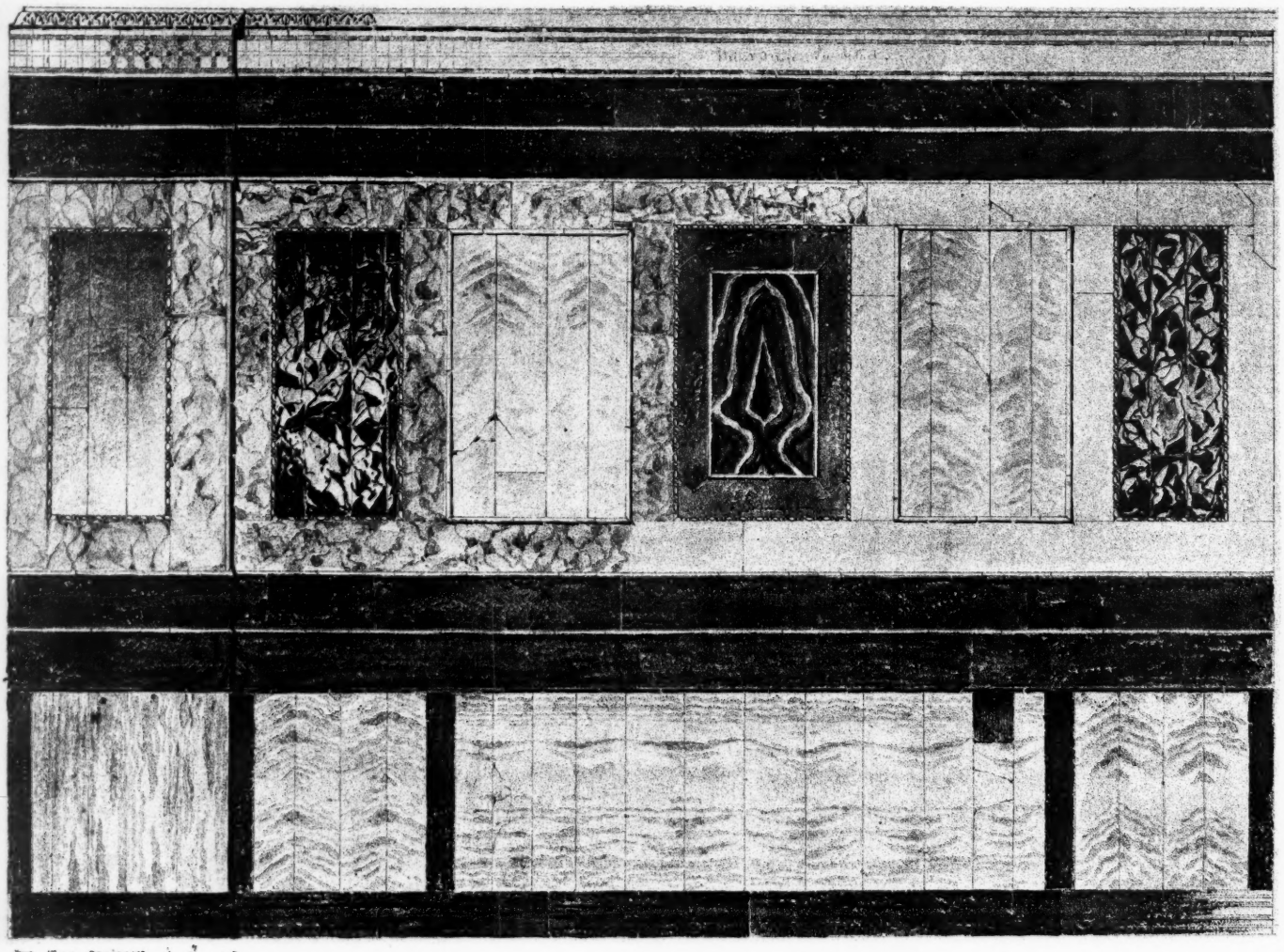
LONDON. ** LIVERPOOL. ** GLASGOW.

352 to 362, Euston-road. 6 and 8, Hatton Garden. 47 and 49, St. Enoch-square.

VIEILLE MONTAGNE SOLE MANUFACTURING AGENTS.

NO SOLDER. NO EXTERNAL FASTENINGS.

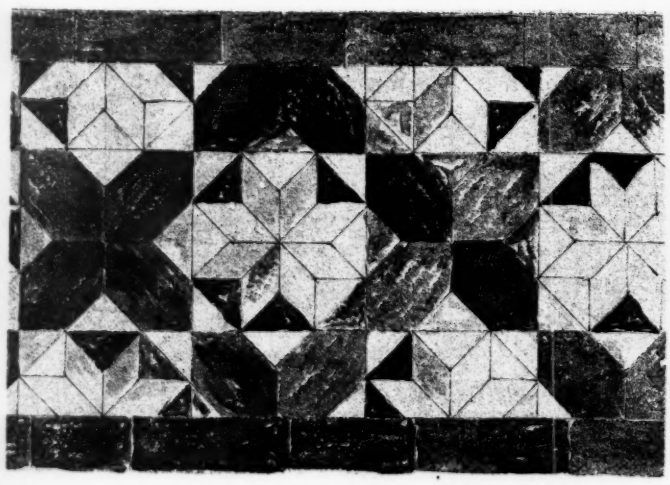
Particulars on Application. Chief Offices:—Fitzroy Works, EUSTON ROAD, LONDON, N.W.



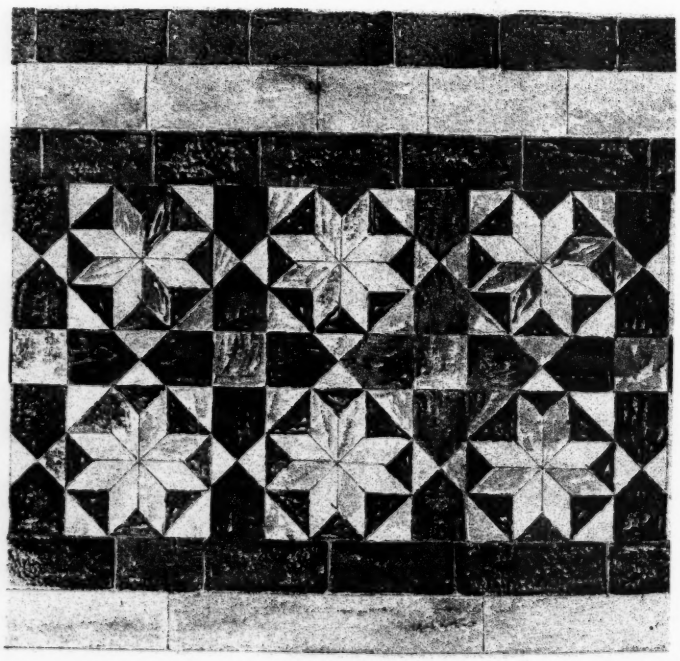
← This Projects 4 0" →

"Μονὴ τῆς Χώρας." Constantinople.
Marble Panelling in Nave.

Scale of Feet



Scale of Inches



Μονὴ τῆς Χώρας. Constantinople.
— Mosaic Frieze —

Drawn by Mr Sidney H. Barnsley

"Ink-Photo" Sprague & Co. 22, Martins Lane, Cannon [illegible] London, E.C.

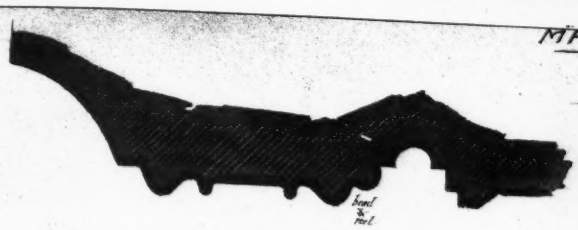
BYZANTINE ARCHITECTURE:

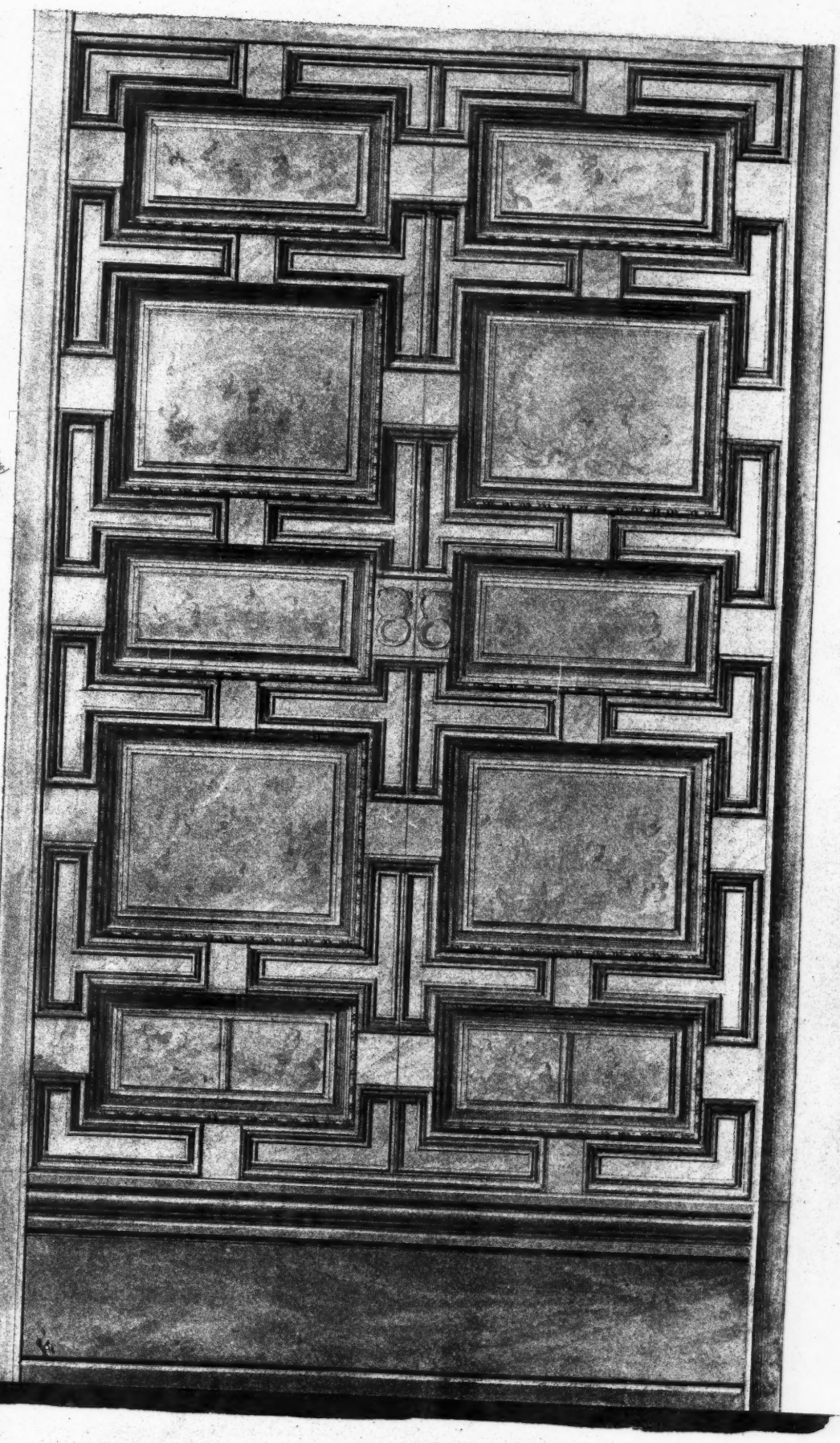
ILLUSTRATIONS TO PROFESSOR AITCHISON'S ROYAL ACADEMY LECTURES. LECTURE V.

MARBLE DOOR : now used as jamb linings :

MONH THΣ XΩRAΣ CONSTANTINOPLE

Detail of mouldings ½ full size.

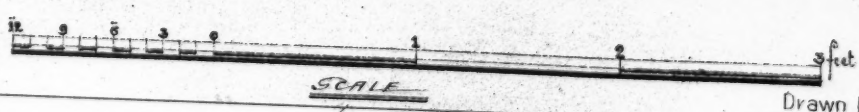




The panels were filled with sculpture but the work has been chipped off by the Turks

The Lions' heads and rings have been worked off

Plinth ½ full size
(Hymettian marble)



Drawn by Mr Sidney H. Barnsley

INK-PHOTO. SPRAGUE & Co. 22, MARTINS LANE, CANNON ST. LONDON, E.C.

BYZANTINE ARCHITECTURE:

ILLUSTRATIONS TO PROFESSOR AITCHISON'S ROYAL ACADEMY LECTURES. LECTURE V.

PHOTO-LITHO. SPRAGUE & Co. 22 MARTINS LANE, CANNON ST. LONDON, E.C.

HAMBLETON OLD HALL: NORTH FRONT, PLAN AND DETAILS.

(Reduced from a plate in Mr. Gotch's "Architecture of The Renaissance in England.")

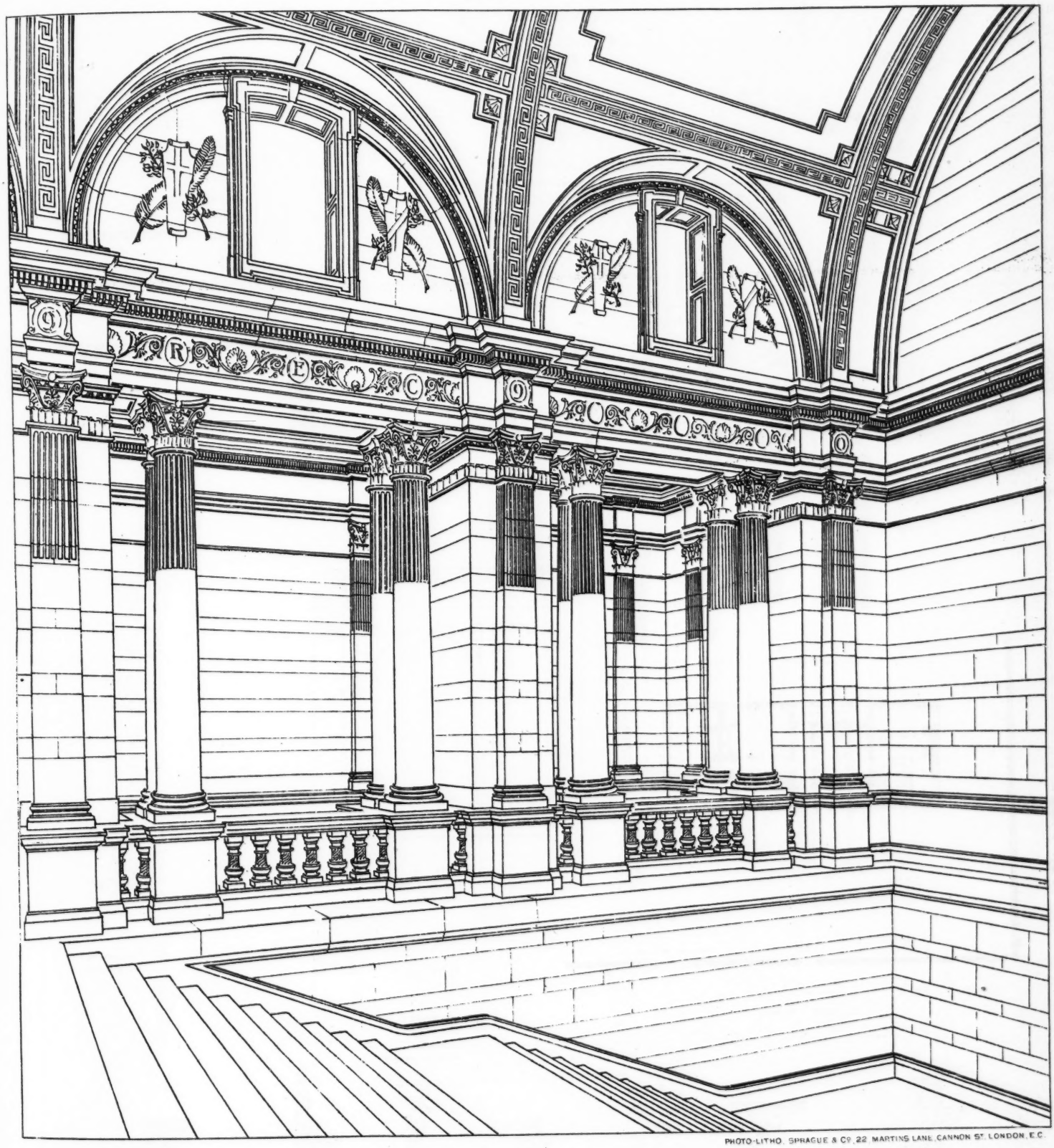
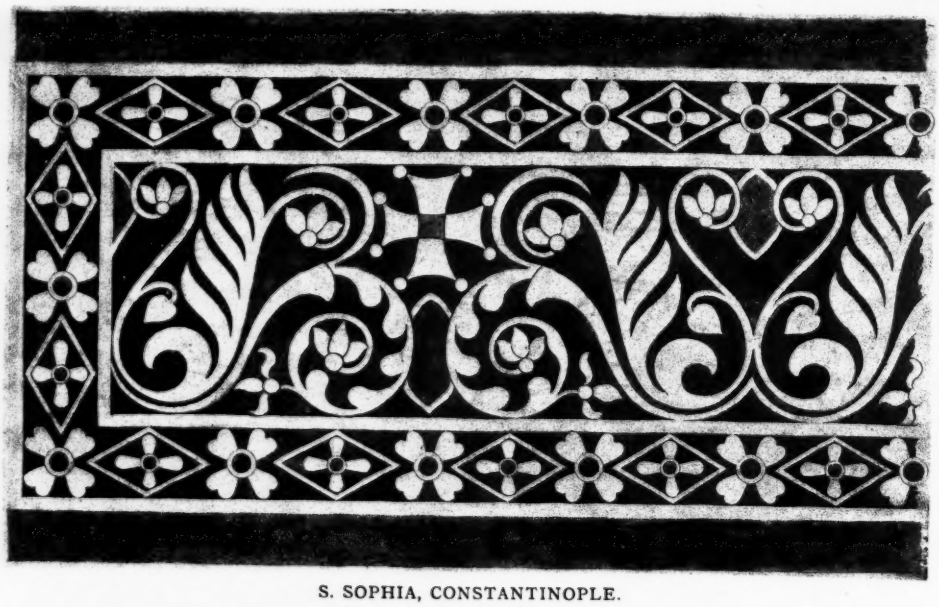


PHOTO-LITHO. SPRAGUE & Co. 22 MARTINS LANE CANNON ST. LONDON. E.C.

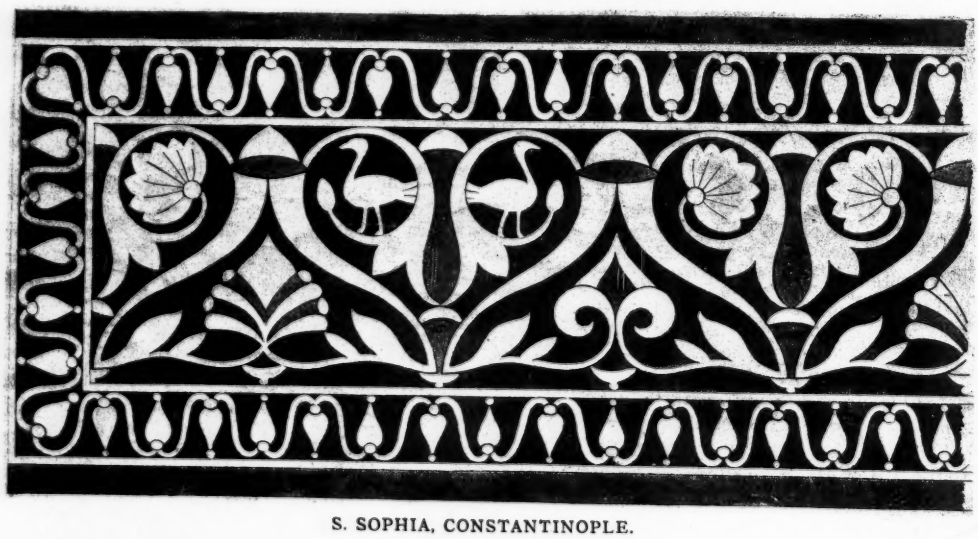
DESIGN FOR A STAIRCASE FOR A TOWN MANSION.—By Mr. T. Davison, A.R.I.B.A.

PERSPECTIVE VIEW.

Submitted in Competition for the "Tite Prize," 1891.

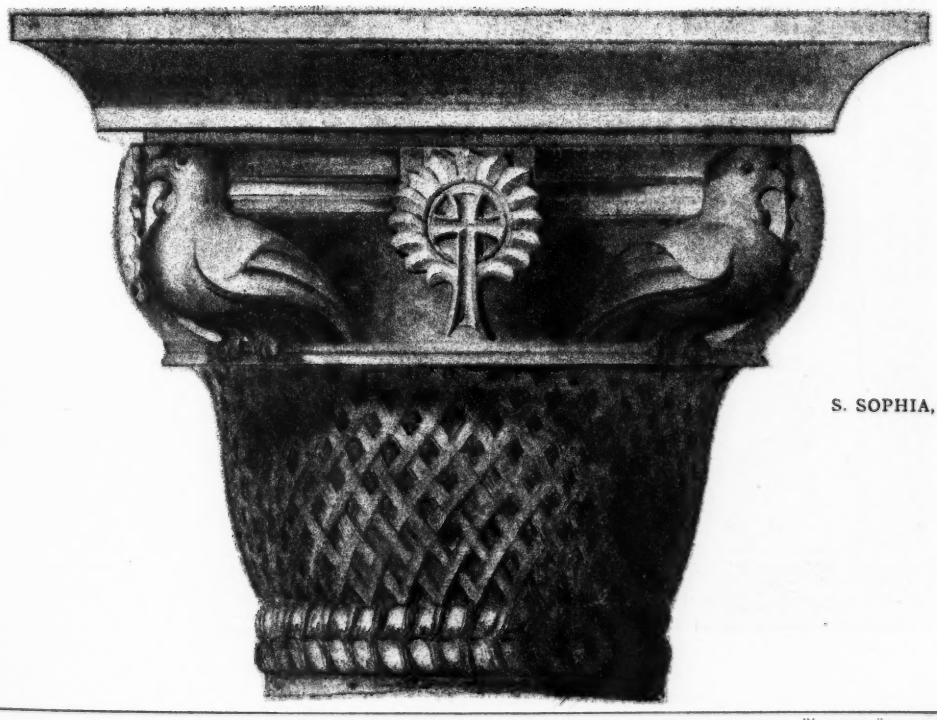


S. SOPHIA, CONSTANTINOPLE.



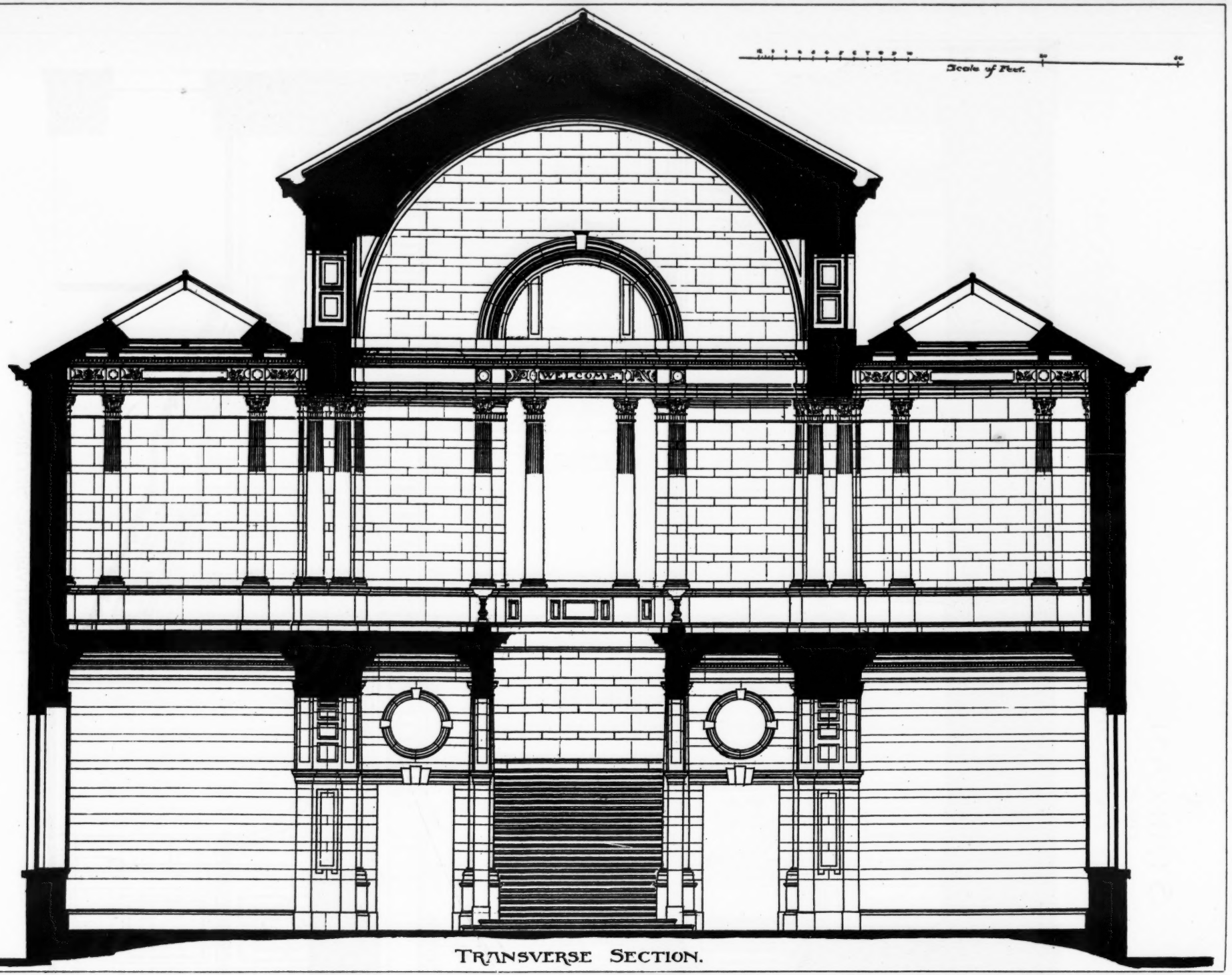
S. SOPHIA, CONSTANTINOPLE.

S. MARKS, VENICE.



S. SOPHIA, CONSTANTINOPLE.

"INK-PHOTO," SPRAGUE & Co. 22, MARTINS LANE, CANNON ST. LONDON, E.C.



TRANSVERSE SECTION.

PHOTO-LITHO. SPRAGUE & Co., 22, MARTINS LANE, CANNON ST. LONDON, E.C.

DESIGN FOR A STAIRCASE FOR A TOWN MANSION.—By Mr. T. Davison, A.R.I.B.A.

Submitted in Competition for the "Tite Prize," 1891.

A STAIRCASE FOR A TOWN MANSION

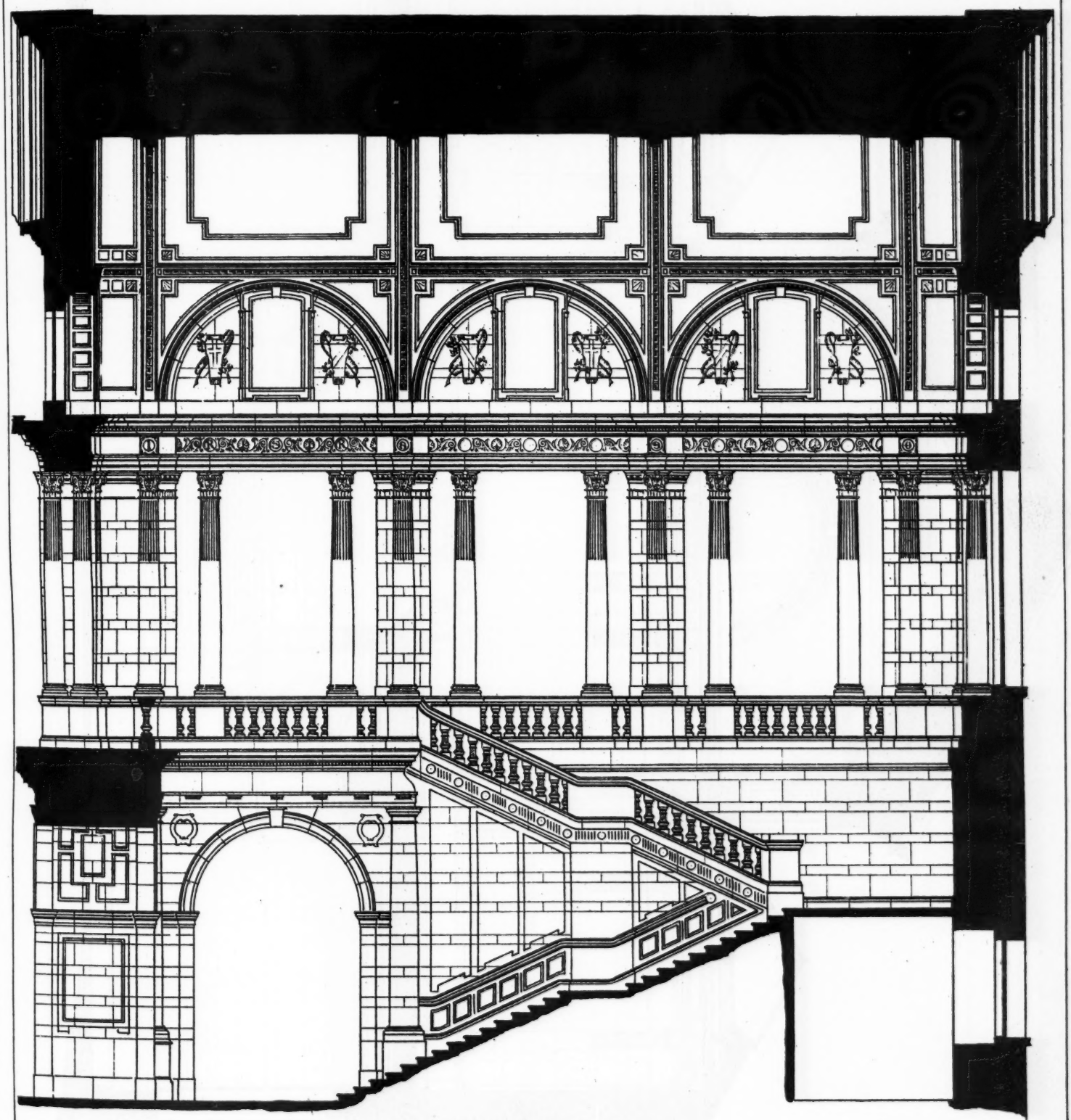


PHOTO-LITHO. SPRAGUE & Co, 22, MARTINS LANE, CANNON ST. LONDON, E.C.

DESIGN FOR A STAIRCASE FOR A TOWN MANSION.—By Mr. T. Davison, A.R.I.B.A.

Submitted in Competition for the "Tite Prize," 1891.

Submitted in Competition for the "Tite Prize," 1891.